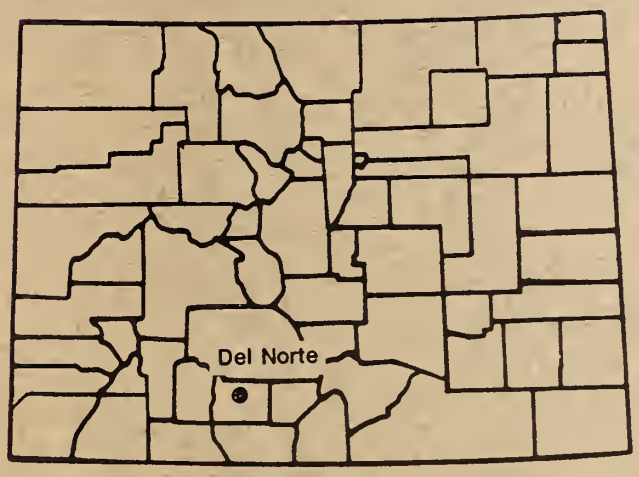
FLOOD PLAIN MANAGEMENT STUDY

RIO GRANDE NEAR DEL NORTE



COLORADO

Prepared by the
U.S. Department of Agriculture
Soil Conservation Service
Denver, Colorado
in Cooperation with the
Colorado Water Conservation Board
and Rio Grande County, Colorado

Sept. 1988

PREFACE

This report includes information on the flood hazard areas along the Rio Grande upstream from Monte Vista in the vicinity of Del Norte, Colorado.

Because of the potential flood damages, detailed flood hazard studies have been recognized as an essential item in guiding the use of flood plains. The purpose of this report is to provide adequate mapping and data for implementing flood plain management programs.

Included in the report is information on past floods, the potential for future floods, flooded area maps, water surface profiles, selected cross sections, peak discharge data, and recommendations for reducing potential flood damages.

The Soil Conservation Service conducted the technical studies and prepared the report. These services were carried out in accordance with the Plan of Work of August, 1986.

The assistance and cooperation provided by the Colorado Water Conservation Board, and Rio Grande County are appreciated and gratefully acknowledged. Financial assistance provided by the Board and Rio Grande County included funds for topographic maps and cross section data.

The survey, hydrologic, hydraulic, and other pertinent data and computations are on file with the U.S. Department of Agriculture, Soil Conservation Service, 2490 West 26th Avenue, Denver, Colorado 80211, telephone (303) 964-0295. Additional copies of this report may be obtained from the Colorado Water Conservation Board or the Soil Conservation Service.

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INTRODUCITON

This flood plain management report was prepared by the U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the Colorado Water Conservation Board, and Rio Grande County. Interpretations of the flood plain management study and recommendations to reduce damages are included; however, it is beyond the scope of this report to provide detailed proposals or plans to rectify the flooding problems.

Objectives

The objective of this study is to provide flood plain management information and mapping to Rio Grande County for use in implementing flood plain management programs which will minimize potential flood losses. Included in the report are engineering and hydrologic data which will facilitate the development of a flood plain management plan, road and bridge designs, and flood control measures (if needed).

Authority

This study was requested by Rio Grande County through the Colorado Water Conservation Board (CWCB). The CWCB is the state coordinator for all flood plain information studies and is responsible for setting priorities and scheduling these studies. The CWCB and the Soil Conservation Service entered into a Joint

Coordination Agreement for flood hazard analysis in January 1972 (revised November 1978). The Plan of Work for the Study was prepared in August 1986.

Section 37-60-106(1)(c), Colorado Revised Statutes, authorizes the Colorado Water Conservation Board "to designate and approve storm or floodwater runoff channels or basins, and to make such designations available to legislative bodies of cities and incorporated towns, to county planning commissions, and to boards of adjustment of cities, incorporated towns, and counties of this state." The board provides assistance to local governments in development and adoption of effective floodplain ordinances. In addition, the Board will provide technical assistance to local entities during the performance of floodplain information studies within Colorado. Presently, direct financial assistance for the performance of floodplain studies is no longer available from the board.

Section 30-28-111 C.R.S. for county governments and Section 1-23-301 C.R.S. for municipal governments of the Colorado Revised Statutes, states: The cities, incorporated towns, and counties with the study area may provide zoning regulations: "...to establish, regulate, restrict, and limit such uses on or along any storm or floodwater runoff chanel or basin that has been designated and approved by the Colorado Water Conservation Board, in order to lessen or avoid the hazards to persons and damage to

property resulting from the accumulation of storm or floodwaters..."

Therefore, upon official approval of this report by the Colorado Water Conservation Board, the areas described as being inundated by the 100-year flood can be designated as flood hazard areas and their use regulated accordingly by the local agencies.

Flood plain management studies are carried out by the Soil Conservation Service as an outgrowth of the recommendations in A Report by the Task Force on Federal Flood Control Policy, House Document No. 465 (89th Congress, August 10, 1966), especially Recommendation 9(c), Regulation of Land Use, which recommended the preparation of preliminary reports for guidance in those areas where assistance is needed before a full flood plain information report can be prepared or where a full report is not scheduled.

Authority for funding flood plain management studies is provided by Section 6 of Public Law 83-566, which authorizes the U.S. Department of Agriculture to cooperate with other federal, state and local agencies to make investigations and surveys of the watersheds and rivers and other waterways as a basis for the development of coordinated programs. In carrying out flood plain management studies, the Soil Conservation Service is being responsive to Executive Order 11988, entitled "Flood Plain Management", and Executive Order 11990, entitled "Protection of Wetlands" (both effective May 24, 1977).

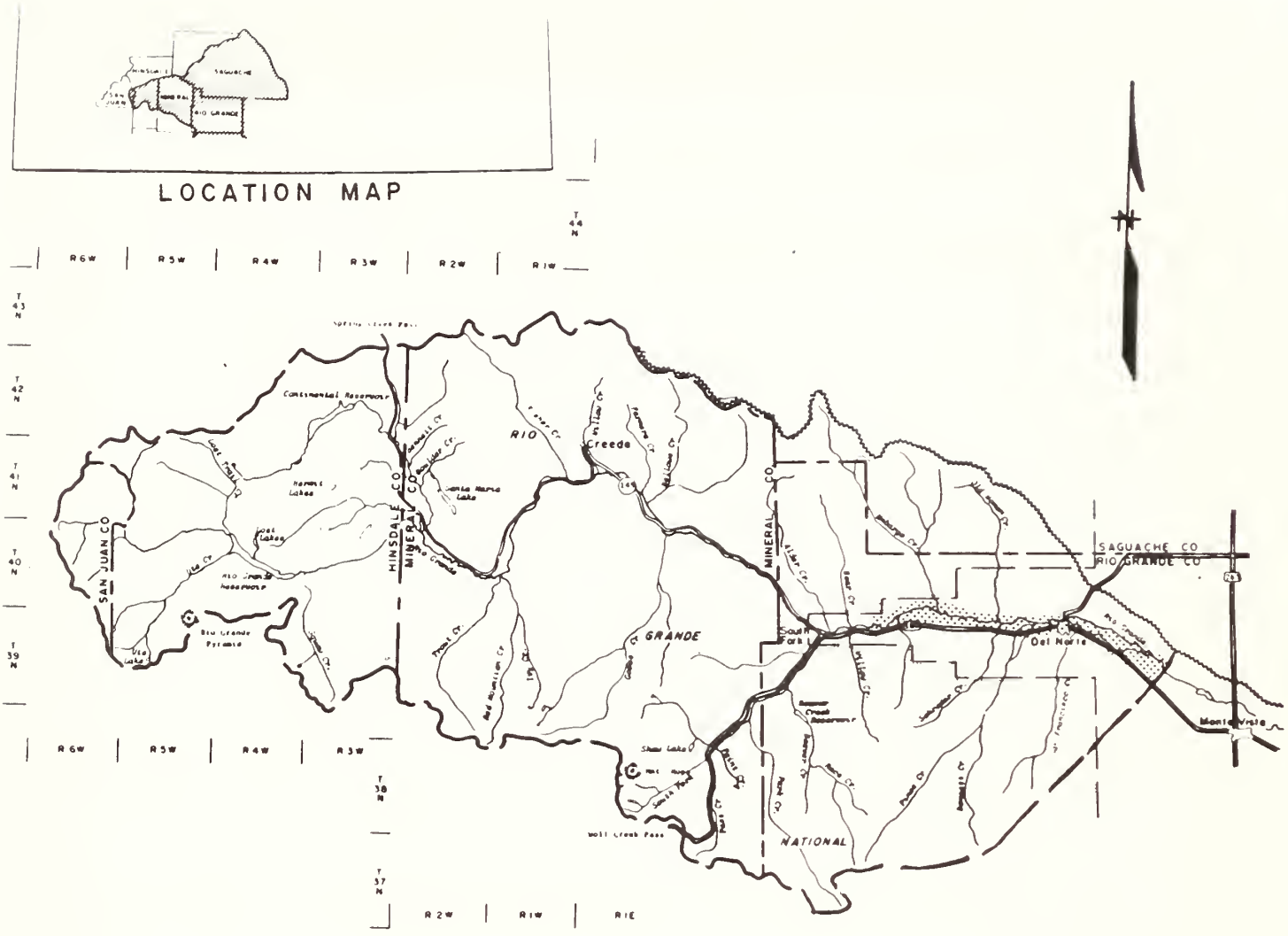


FIG 1 WATERSHED MAP
RIO GRANDE NEAR DEL NORTE

DESCRIPTION OF THE STUDY AREA

Basin Characteristics

The Rio Grande Basin in Colorado varies in elevation from over 13,000 feet in the San Juan mountains to about 7,700 feet at the lower end of the study area. The drainage area near Del Norte is about 1,200 square miles. The Rio Grande is fed by several streams which drain portions of San Juan, Hinsdale, Mineral, Saguache and Rio Grande Counties, see Figure 1.

The weather station at Del Norte shows the average annual precipitation to be 9.4 inches. The higher mountains accumulate as much as 40 inches of precipitation on the average, most of which occurs as snow. Melting of the snowpack provides high runoff during the spring and diminishing flows as summer progresses. In Del Norte, the normal mean temperature ranges from 21.4 degrees (fahrenheit) in January to 63.5 degrees in July. The mean annual temperature is 43.1 degrees.

Much of the upper basin vegetation is Confier with some Aspen, brush, grasslands and meadows. The lower elevations include pinon, Juniper, various brush species, grasses and some irrigated pasture and hayland.

Study Limits

The study area includes three reaches of the Rio Grande in Rio Grande County. The upper study limit is located just

downstream from the town of South Fork. The lower limit is located near Seven Mile Plaza between the town of Del Norte and Monte Vista. Figure 4 shows the study reaches and map sheets that define the flood plains. The lengths of each reach are as follows:

Reach 1 - beginning at a point below Seven Mile Plaza and extending upstream approximately 3.1 miles.

Reach 2 - beginning at a point below the Del Norte sewage treatment ponds and extending upstream approximately 4.1 miles to a point about 1.5 miles upstream of Del Norte.

Reach 3 - beginning at a point below state bridge and extending upstream approximately 9.5 miles to Gerard Bridge near Alpine.

Total length of study is 16.7 miles.

Gaps separating the reaches, totaling about 10 miles, were not studied because of a limited budget and the need for flood plain information is not as critical at these locations.

Natural and beneficial Flood Plain Values

Flood plains along the Rio Grande River contain areas of irrigated pasture and hayland interspersed with areas of natural vegetation. The flood plain vegetation consists of a variety of forbs, grasses, sedges and rushes interspersed with cottonwoods, willows and siberian elm. The meandering channel provides an interesting diversity in landscape and vegetation. This

diversity enhances the visual aesthetics and wildlife habitat values in the area.

These flood plains support a variety of wildlife species such as: mule deer, coyote, cottontail, ret-winged blackbird, blue herron, song sparrow, black-headed grosbeak, red-tailed hawk, golden eagle, bald eagle, Canada goose, mallard and many other species of wildlife. These riparian areas are very important in the arid regions of Colorado. The proximity to water and robust vegetation supported by the water regime attract more species of wildlife to this habitat type than any other.

RELATED FLOOD STUDIES

There are nine previous related flood studies available for reference. Time and funds were not available to research each of these reports in any great detail. However, available hydrologic information was reviewed and used for reference purposes. Following is a list of the nine studies:

1 - "Flood plain Information, Rio Grande, Monte Vista, Colorado," dated June, 1969, by U.S. Army Corps of Engineers.

2 - "Map of Flood Plain Areas," dated 1974, by U.S. Geological Survey.

3 - "Flood Hazard Boundry Maps," dated February , 1974, by HUD.

4 - "Flood Hazard Boundry Maps," dated June, 1976, by HUD.

5 - Approximate Information for the Entire Reach of the Rio Grande in Rio Grande County, dated 1970, by Dr. Donald Doering.

6 - Flood Hazard Study, South Fork Rio Grande, and Rio Grande in the Vicinity of South Fork, Colorado, dated October, 1980, by the Soil Conservation Service.

7 - "Flood Insurance Study" for Del Norte, dated March, 1982, by FEMA.

8 - "Flood Insurance Study" for Monte Vista, dated May 1982, by FEMA.

9 - "Flood Insurance Study" Rio Grande County, Unincorporated Areas, dated May 1987, by FEMA.

Study reference number 6, by the Soil Conservation Service, provided peak discharge - frequency values appropriate for the upper end of this current study. The two studies meet at the Gerard Bridge road. There are some hydraulic and topographic differences at the Gerard Bridge because of construction work that ocurred in 1984. For that reason the affected map and profile sheet from the 1980 report will be revised to current conditions and re-issued to interested parties.

FLOOD HISTORY

Flooding in the study area can result from snowmelt runoff, general rains, cloudburst storms, or a combination of these conditions. The runoff from snowmelt occurs during the period from late May to early July. Runoff from snowmelt is characterized by moderate peak flows of long duration, and large volumes of water. Most of the annual rainfall occurs during the month of July through October. The intensity of rainfall is moderate to high and the runoff is characterized by high peak flows of short duration with relatively small volumes of water.

Historic Floods and Discharge Frequency Values

	Location	Discharge Cubic Feet/Second
Spring 1884	Alamosa	20000 +
June 5, 1905	Del Norte	10000
Oct. 5, 1911	Del Norte	18000
June 13, 1921	Del Norte	9630
June 29, 1927	Del Norte	15000
	Monte Vista	18500
May 22, 1948	Del Norte	8840
June 19, 1949	Del Norte	10000
May 30, 1979	Del Norte	8030
June 9, 1985	Del Norte	8920
June 7, 1986	Del Norte	7620
June 16, 1987	Del Norte	7490

****

10 yr. freq.	Del Norte	8400
50 yr. freq.	Del Norte	11400
100 yr. freq.	Del Norte	12700
500 yr. freq	Del Norte	15800

It should be recognized that past flooding can be used as an indicator of possible future flooding, however, continuing changes to roads, bridges, river channel and flood plains can cause differences in flood elevations.

The flood of 1884, caused primarily by extraordinary snow cover, lasted longer than others. The river was at overflow stage at Del Norte from May 24 to June 20.

The 1911 flood was unique because of the date, October 5, and the fact that it was rainfall generated. Water was 1.5 to 2.0 feet deep at the intersection of 4th and Pine Streets. The railroad tracks, just outside the depot, were inundated.

The 1927 flood was caused by a combination of factors - heavy snow cover, precipitation in the form of snow, followed by a sudden increase in temperature, and rain during the period of maximum snow melting. The north side of Del Norte and a portion of the railroad tracks were flooded. A more detailed description of this event is given in the following newspaper article from the Monte Vista Journal, July 1, 1927.

> "Rio Grande River Reaches Flood Stage and Great Damage Results to the Roads, Bridges and Crops"
>
> A number of cloudbursts and incessant rain for four days on the Rio Grande watershed have caused the Rio Grande River to go on a rampage during the past week, flooding the low lands and river ranches and covering approaches to the river bridges. A number of the bridges on the highway between Monte Vista and Creede have gone out.

The Squaw Creek and "Thirty-mile" bridges, near the Farmers Union, were taken out by the high water which reached a tremendous crest the first of the week. Other bridges removed were the Art Neale bridge at Blue Creek, the Riverside bridge and the Collar bridge. The bridge at Wagon Wheel Gap is safe but the approaches are flooded.

The D&RGW train went to Del Norte Wednesday but backed down to Monte Vista as the tracks were threatened. Since that time the train has not gone west beyond this town.

Although some cars have passed over the Gunbarrel road between town and the bridge, almost the entire distance is under water and the same condition is found in the Soldiers' Home lane and the Stoeber lane. Residents of the north country are making their trips to this place by way of Alamosa.

Besides the damage to roads and bridges, the lettuce crops up the river and hay crops are badly affected. Some cattle were drowned near Del Norte.

The water reached the Lightner place, one-half mile north of Monte Vista.

Clear weather today and the noticeable lowering of the water in the river indicates that the danger of further flooding is past, unless rains should start again.

It is reported that some CF&I bunk houses and a garage on Squaw Creek were washed away by a cloudburst Tuesday morning.

Some of the buildings in the northern part of Del Norte are full of water, five feet being reported in the old creamery.

This year's high water is not believed to be as great as the flood of 1911 but the damage cannot be accurately estimated until the waters recede.

This flood plain management study as well as historical accounts of flooding indicate waters endanger the town of Del Norte when the Rio Grande discharge approaches 8500 cfs. This is supported by a local newspaper account of the 1985 flood. The river peaked at 8900cfs on June 9, 1985. Flood waters approached the town from the west across Spruce Street. The town residents and others made a massive attempt to prevent the waters from continuing into town by placing 3000 sand bags between highway 112 and Spruce Street. This helped, however, water overtopped the railroad and flooded the town in the vicinity of 3rd and 4th Streets. Further down the river, flooding also occurred at Seven Mile Plaza.

The three consecutive years 1985-86-87, each measured 150 percent or more of the average annual runoff. The annual peak discharge values were in the vicinity of a 10-year frequency.

INVESTIGATIONS AND ANALYSIS

Interpretation and Use of Report

A. Frequency and Discharge

The 10-, 50-, 100-, and 500-year flood events are used as the flood frequencies for this flood plain analysis. Thus, the data developed in this report will be suitable not only for regulation purposes, and H.B 1041 designation but also for Federal Insurance Administration flood insurance studies conducted by the Federal Emergency Management Agency.

These various flood events have an average occurrence of once in the number of years as indicated. For example, the 100-year flood occurs, on the average, once in a 100-year period, and has a one percent chance of being equaled or exceeded in any given year.

The particular uses for the various flood events in addition to those stated above are as follows:

10-Year and 50-Year Flood Events

Information regarding these lower frequency floods is especially useful for future engineering studies and land use planning purposes related to minor road systems, minor channel improvements, the location of parks and recreational facilities, agricultural lands, and appurtenant structures. The use of the lower frequency floods may be considered in planning flood prevention projects to protect agricultural areas, or other property where risk to life is not a factor.

100-Year Flood Event

The 100-year flood event may be used in lieu of lower frequencies for engineering design purposes where greater security from structure failure is desired.

However, the most important use of the 100-year flood event lies in flood plain management and land use planning as set forth in the state statutes. The State of Colorado considers the 100-year frequency flood as the flood event to be used in designing and protecting structures and dwellings for human occupation. Therefore, all flood plain regulations are based upon the 100-year flood.

500-Year Flood Event

The 500-year flood event is useful in making the public aware that floods larger than the 100-year flood can and do occur. Just because a person is living above the 100-year flood boundary does not mean that he is completely safe from flooding. The 500-year flood event can also be used for regulating high risk developments within the flood plain such as nuclear power plants, or the storage or manufacture of toxic or explosive materials.

B. Flood Elevation

Flood crest elevations for the 10-, 50-, 100-, and 500-year floods, as determined at each cross section, may be found in Table 1 "Flood Frequency-Elevation and Discharge Data". Figures, 5 through 7, show a graphical representation of high water

elevations at typical valley cross sections. Water surface elevations computed at each cross section were used to prepare flood profiles, sheets 1 through 25, which show the streambed elevation in relation to water surface elevations for the 10-, 50-, 100-, and 500-year frequency floods.

The flood profiles may be used in areas where controversy arises over the 100-year flood boundary shown on the Flood Plain Maps. Since the flood profile exhibits give the water surface elevation at a specific point on the reference line, the flood elevations can be surveyed on the ground to alleviate any discrepancies on the base map.

C. Flooded Areas

Flood plain maps, sheets 1 through 20, show the boundary of the 100-year flood plain. Normally the 500-year frequency flood plain is also shown on these maps, however the wide flood plain involved in this study make it impossible in most locations to differentiate between the two frequencies on the scale of maps published in this report. The flood plain boundary was plotted using flood contour elevations and stationing from the plotted flood profiles. This was done at elevation intervals compatable with the map contour intervals. Flood contour, shown as wiggly lines, extend perpendicular to the direction of flow and intersect the ground at the edge of the flood plain.

The area included within the 100-year flood line boundary is about 3,850 acres for the 16.7 miles of river.

D. Floodway

Artificial fill encroachment on flood plains can reduce the areal extent of a flood plain and provide additional space for other uses. As an alternative to the present flooding situation, a possible floodway with flood plain encroachment up to 1.0 ft. rise will be studied for selected portions of the study reach. The result of this analysis will be shown in a document separate from this report.

Hydrology

The discharge-frequency information for this study was developed from stream gage data and previous studies. The magnitude of discharges for the upper end of the study reach was determined from published values given in the October, 1980 report "Flood Hazard Study, South Fork Rio Grande and Rio Grande in the Vicinity of South Fork, Colorado", by the Soil Conservation Service. Discharge-frequency values at a second location within the study area was developed from 70 years of stream gage data (Rio Grande near Del Norte) analysed according to procedures given in "Bulletin 17B, Guidelines for Determining Flood Flow Frequencies."

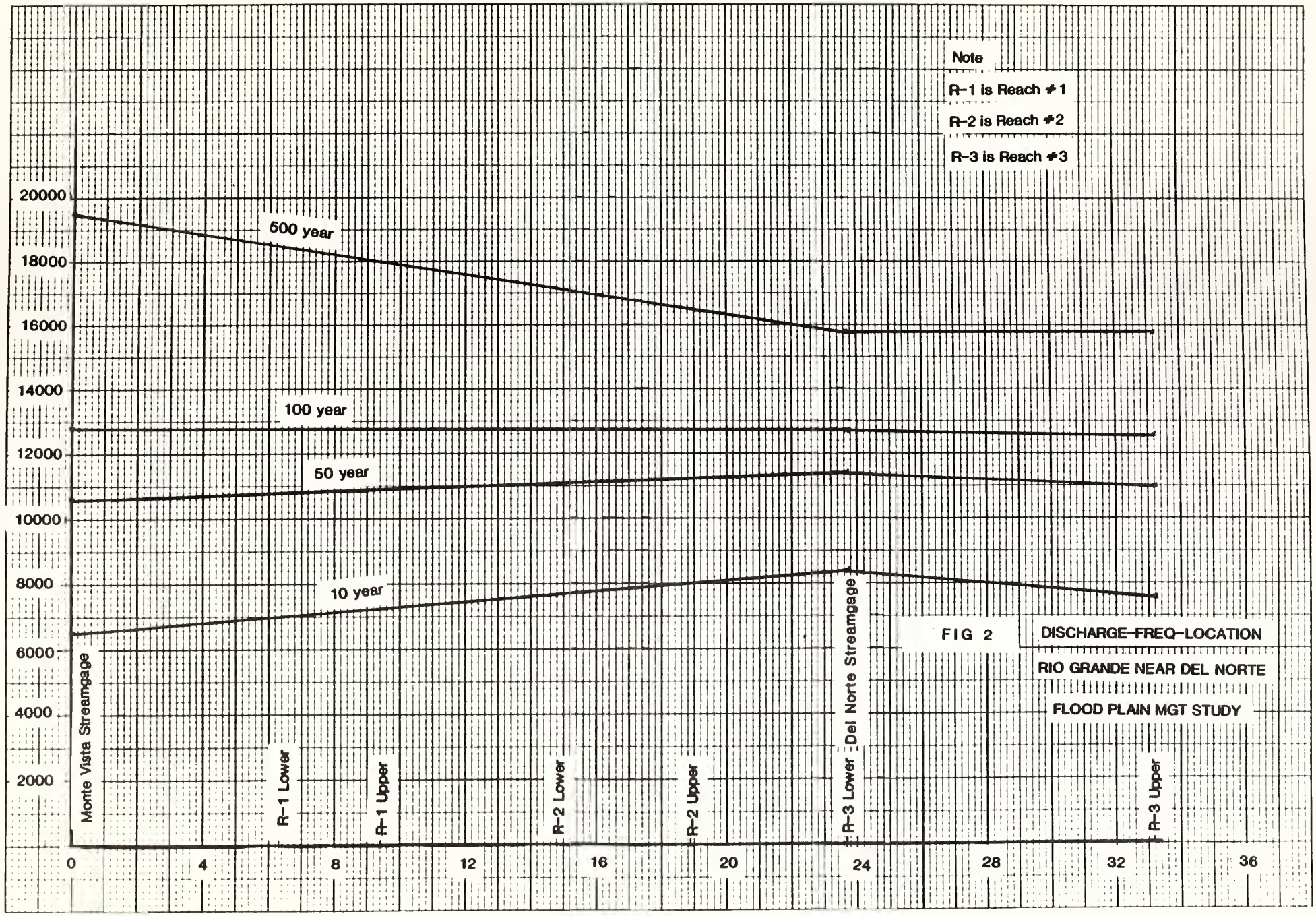
Discharge-frequency values for the lower end of the study reach is less straight foreward because of irrigation diversion influences. The primary data references for this location is streamflow data (Rio Grande River near Monte Vista) and historical irrigation diversions. Major canals such as the Rio

Grande Canal, The Farmers Union Canal, and others divert irrigation water from the river in variable quantities according to the river stage, and the level of demand by irrigators.

It was determined for this study that minimum diversions, which might reflect a wet spring, would be the safest assumption. Therefore, discharge-frequency values at the Monte Vista stream gage location reflect this assumption and are slightly higher than if historical average diversions were assumed.

One example that supports this assumption is the spring of 1987. It was a wet spring and irrigators did not call for irrigation water. Therefore, high flows remained in the river producing a greater threat of flooding.

A discharge-frequency-profile was plotted using the preceeding data (figure 2) and used as the basis for this study. Only the resulting 100-year frequency discharge at Monte Vista compares closely with the value published by the Federal Emergency Management Agency Flood Insurance Study Report for Rio Grande County, Unincorporated Areas, May 1987. Discharge vlues by cross section location are given in Table 1.


Note
R-1 is Reach #1
R-2 is Reach #2
R-3 is Reach #3
500 year
100 year
50 year
10 year
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
DISCHARGE - CFS
Monte Vista Streamgage
R-1 Lower
R-1 Upper
R-2 Lower
R-2 Upper
R-3 Lower
Del Norte Streamgage
R-3 Upper
0
4
8
12
16
20
24
28
32
36
MILES UPSTREAM FROM MONTE VISTA STREAMGAGE
FIG 2
DISCHARGE-FREQ-LOCATION
RIO GRANDE NEAR DEL NORTE
FLOOD PLAIN MGT STUDY

Hydraulics

The U.S. Army Engineers HEC-2 computer program was used to perform water surface profile computations. The program uses the standard step back water method. Dimensions for bridges were determined from field investigations and their configurations were integrated into appropriate cross section data.

Cross section data, and reach length information were obtained from orthophoto topographic maps. Maps were prepared especially for this study, at a scale of 1 inch = 200 ft. with 4.0 ft contour intervals and 2.0 ft intermediate contours.

Hydraulic roughness coefficients (Mannings n-Values) were determined from field investigations and documented with photographs (in technical addendum). A tabulation of roughness coefficients is included in the technical addendum. There was no blockage considered at bridges.

Water surface profiles, typical cross sections and maps showing the 100-year flood boundaries are shown on included exhibits and flood plain maps. Table 1 shows computed flood elevations at specific cross sections.

Flood lines were located on the maps by transferring flood elevations (at map contour intervals) from plotted profiles (from HEC-2) to the maps, using stationing along the main channel as the location reference. These points were connected and smoothed to create the map flood lines.

Aerial photographs used to develop digitized cross section data were taken May 5, 1986, which was during spring high water. Flow in the river was approximately 2700 cfs. Digitized elevations in the channel were at water surface rather than channel bottom. Therefore, cross section elevations were adjusted to account for the channel geometry below water surface. This adjustment was made by assuming trial channel depths and computing water surface profiles (at 2700 cfs) until the computed elevations approximated those on the date of photography. Once this calibration was made, discharges for the 10-, 50-, 100-, and 500-year frequencies were used in computing additional profiles.

Significant divided flow occurs at two locations along reach number 2. The first location is at Highway 112 in Del Norte. Right overbank flows move into Del Norte and cross Highway 112 over a width of about 1200 feet and maximum depth of 1.6 feet (100-year frequency). About 17 percent of the total flow moves through Del Norte and on downstream confined between the railroad grade on the north and Highway 285 on the south.

A second location of divided flow occurs also in reach 2, downstream from Del Norte. The Rio Grande has a north channel and a south channel below a diversion structure at cross section 114. The north channel supplies water to irrigation canals and contributes to a divided flow condition between cross section 110 and 102, see figure 3.

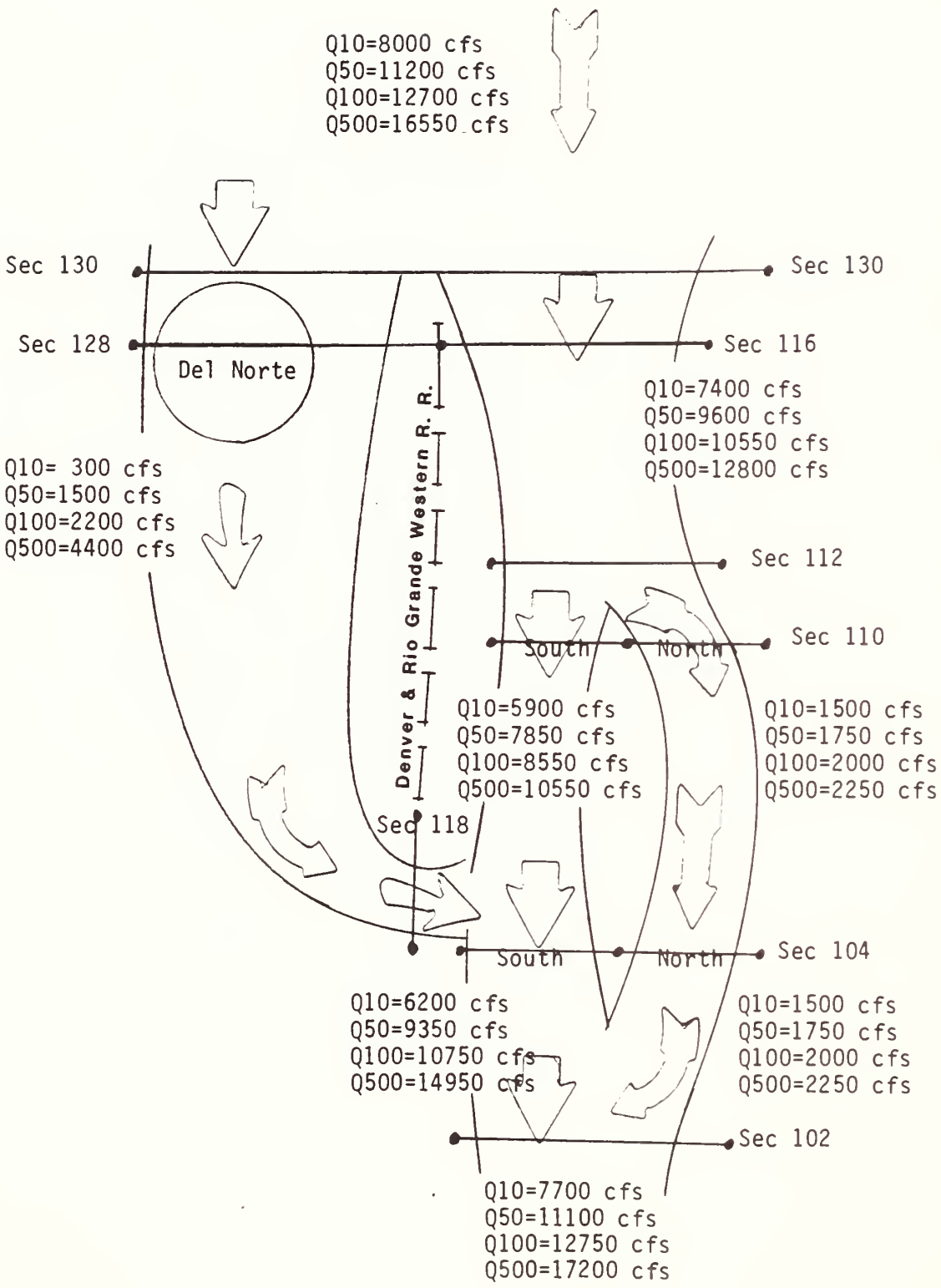


FIG 3 Divided Flow Along Reach 2

FLOOD PLAIN MANAGEMENT

Potential flood damages to existing development and possible loss of life can be alleviated or lessened through non-structural and structural flood hazard mitigation methods.

Non-structural methods include: local flood plain regulations, land treatment, flood warning and forecasting systems, flood insurance, flood proofing, flood fighting and emergency evacuations.

Local Regulations

The need to minimize property damage due to flooding has been recognized by planners and local community officials. Subdividers and developers are required to submit proposed storm drainage plans to the planning commission for approval. In the past, drainage plans have been prepared singularly or an a plat-by-plat basis. Information contained in this report will be useful in developing a master drainage plan for the study area. This report provides the outline of flood hazard areas on large scale maps specifically for this purpose.

The city may provide zoning regulations...

"...to establish, regulate, restrict, and limit such uses on or along any storm or floodwater runoff channel or basin, as such storm or floodwater runoff channel or basin has designated and approved by the Colorado Water Conservation Board, in order to

lessen or avoid the hazards to persons and damage to property resulting from the accumulation of storm or floodwaters...." as stated in Section 30-28-111 for county governments and Sections 31-23-301 for municipal governments of the Colorado Revised Statutes.

Colorado Natural Hazard Area Regulations

In 1974, the Colorado General Assembly passed House Bill 1041, a bill "concerning land use, and providing for identification, designation, and administration of areas and activities of State interest,..." (H.B. 1041, Title 24, Article 65.1, CRS, as amended). Areas of State interest include natural hazard areas, or those areas that are "so adverse to past, current, or foreseeable construction or land use as to constitute a significant hazard to public health and safety or to property." Flood plains are natural hazard areas.

With reference to the administration of natural hazard areas, section 24-65.1-202(2)(a) of the Act provides: Flood plains shall be administered so as to minimize significant hazard to public health and safety or to property; open space activities shall be encouraged; structures shall be designed in terms of use and hazards; disposal sites and systems shall be discouraged which, in time of flooding, would create significant hazards to public health and safety or to property.

The Act further provides that after promulgation of guidelines for land use in natural hazard areas..., the natural

hazard areas shall be administered by local government in a manner which is conisitent with the guidelines for land use in each of the natural hazard areas.

Colorado Water Conservation Board Designation

Concerning the designation of the flood plain, the Colorado Water Conservation Board is charged with the primary responsibility for:

1. Making recommendations to local governments and the Colorado Land Use Commission.
2. Providing technical assistance to local governments.

The Board's power and duty is...

> ...to devise and formulate methods, means and plans for bringing about the greater utilization of the waters of the state and prevention of flood damages therefrom, and to designate and approve storm or floodwater runoff channels or basins, and to make such designations available to legislative bodies of cities and incorporated towns, to county planning commissions, and to boards of adjustment of cities, incorporated towns, and counties of this state"...

as stated in Section 37-60-106 (1)(c) of the Colorado Revised Stautes

Upon review and approval of this report, the Colorado Water Conservation Board will designate and approve as flood plain areas those areas inundated by the 100-year flood as described by

the floodwater surface elevations and profiles in this report. The use of the designated flood plain areas may then be regulated by the local government.

Model Regulations

Model flood plain regulations have been promulgated by the Colorado Water Conservation Board, with the purpose to promote public health, safety, and general welfare, and minimize flood hazards and losses. The model includes provisions designed to:

1. Promote sound planning and permit only such uses within flood plains that will not endanger life, health, and public safety or property in times of flooding.
2. Protect the public from avoidable financial expenditures for flood control projects, flood relief measures, and the repair and restoration of damaged public facilities.
3. Prevent avoidable interruption of business and commerce;
4. Minimize victimization of unwary home and land purchasers; and
5. Facilitate the administration of flood hazard areas by establishing requirements that must be met before use or development is permitted.

The Board's model flood plain regulations offer two options for management of the 100-year flood plain. These are the Hazard Area Concept and the Floodway Concept.

The Hazard Area concept defines the areas of the flood plain in which waters of the 100-year flood attain a maximum depth

greater than one and one-half feet as a high hazard area, and a depth less than this as a low hazard area. The Board recommends that no basements should be allowed for structures located within the low hazard area and all habitable living quarters (first floors) should be constructed a minimum of one foot above the 100-year floodwater surface elevations. Development is prohibited in high hazard areas.

The Floodway concept, used in this study, defines the channel of a stream and adjacent flood plain areas that must be kept free of development in order to safely pass the 100-year flood with a minimal rise in the water surface elevation. The rise must be no more than one foot to meet federal standards.

The U.S. Army Engineers HEC-2 computer program was used to make the floodway analysis. Floodway information is included in a separate appendix. Data are in tabular form and include floodway widths, cross secitonal flow area, and average velocities. Computations are for an increase in rise of water surface elevations of 1.0 feet above the 100-year flood.

Flood Insurance

The National Flood Insurance Act of 1968 (Title XIII of the Housing and Urban development Act, P.L. 90-448) recognized the necessity for flood plain management. This Act makes federally subsidized insurance available to citizens in communities that adopt regulations controlling future developments of their flood

plain. In respect to encroachment on the flood plain, the regulations require:

(1) New residential construction or substantial improvement of existing homes must have the lowest floor level above the elevation of the 100-year flood.

(2) Non-residential construction must meet the same standard or be flood proofed to that level.

The 1968 Act benefits owners of structures already in the flood-prone areas by providing insurance coverage that had been unavailable through private companies. The Act created a cooperative program of insurance against flood damage by the private flood insurance industry and the federal government.

The amount of coverage available and the premium rate varies considerably depending on property location within the flood plain and the property value. All property owners shown on this study to be within areas subject to flooding should consider the purchase of flood insurance.

Additional information on the flood Insurance Program is available from local insurance agents or brokers and the:

Federal Emergency Management Agency, Region VIII
Natural and Technological Hazard Division
Building 710
Denver Federal Center
Denver, CO 80225
Telephone 235-4830

The National Flood Insurance Program used the floodway concept in it's rate studies for communities participating in the regular phase of the programs.

Flood Warning and Flood Forecasting Systems

The National Oceanic and Atmospheric Administration (NOAA) through it's National Weather Service (NWS), maintains year-around surveillance of weather and flood conditions. Daily weather forecasts are issued through the NWS and disseminated by radio and television stations. A general alert to the danger of flash flooding is one of the services provided by the NWS.

Evacuation Plan

An "Emergency Evacuation and Operations Plan" would provide for alerting the public of potential flooding, and coordinating community and county services during an emergency. Plan implementation during the time of an emergency requires cooperation of the general public as well as local officials. This is especially important for flood fighting, evacuation, and rescue operations. Communication is extremely important during flood alerts. Warnings issued through the NWS are disseminated by radio to state and local officials.

RECOMMENDATIONS

The following recommendations are included for consideration in reducing potential flood damages.

1. Local units of government should update thier flood plain management or flood hazard mitigation plan and incorporate the findings of this study.
2. Existing restrictions that contribute to overbank flooding should be corrected where possible and when possible.
3. Detailed studies of specific structural alternative measures such as floodways or dikes should be considered.
4. Owners and occupants of buildings and other property within or adjacent to the delineated flood boundary should consider flood insurance.
5. Information and education programs on flood hazards should be made available to the public.
6. Native habitat along the main channels should be maintained to preserve channel stability and provide wildlife habitat.

GLOSSARY OF TERMS

Channel - A natural or artificial water course of perceptible extent with definite banks to confine and conduct continuously or periodically flowing water. Channel flow is that water which is flowing within the limits of the defined channel.

Flood - Water from a river, stream, water course, lake or other body of standing water, that temporarily overflows the boundaries within which it is ordinarily confined.

Flood Crest - The maximum stage or elevation reached by the waters of a flood at a given location.

Flood Frequency - A means of expressing the probability of flood occurrences as determined from statistical analysis of representative streamflow or rainfall and runoff records. The frequency of a particular stage or discharge is usually expressed as occurring once in a specified number of years. The 10-, 50-, 100-, and 500-year frequency floods have an average frequency of occurrence in the order of once in the number of years indicated.

10-Year Flood - A flood having an average frequency of occurrence of once in 10 years. It has a 10 percent chance of being equaled or exceeded in any given year.

100-Year Flood - A flood having an average frequency of occurrence of once in 100 years. It has a 1 percent chance off being equaled or exceeded in any given year.

Flood Hazard Areas - Areas susceptible to flood damage.

Flood Peak - The highest stage or discharge attained during a flood event; also referred to as peak stage or peak discharge.

Flood Plain - The relatively flat or lowland area adjoining a river, stream, watercourse, lake, or other body of standing water which has been or may be covered temporarily by flood water. For administrative purposes the flood plain may be defined as the area that would be inundated by the 100-year flood.

Left Stream Bank - The left bank of the stream looking downstream.

Perched Channel Flow - A condition where the flow elevation in the outer portions of the flood palin is higher than the flow elevation in the main channel. This condition occurs when a higher secondary channel receives inflow from some location upstream and maintains a flatter slope than the main channel.

Reach - A hydraulic engineering term used to describe longitudinal segments of a stream or river.

Right Stream Bank - The right bank of the stream when looking downstream.

Runoff - That part off precipitation, as well as any other flow contributions, which appears in surface streams of either perennial or intermittent form.

Stream - Any natural channel or depression through which water flows whether continuously, intermittently, or periodically, including modification of the natural channel or depression.

Structure - Anything constructed or erected, the use of which requires a more or less permanent location on or in the ground. Includes but is not limited to bridges, buildings, canals, dams, ditches, diversions, irrigation systems, pumps, pipelines, railroads, roads sewage disposal systems, underground conduits, water supply systems and wells.

Typical Valley Cross Section - An engineering drawing of a vertical section of a stream channel and adjoining landscape as viewed in a downstream direction. The drawing represents a specified location within a designated stream reach.

Water Surface Profile - (This term is synonymous with Flood Profile) - a graph showing the relationship of the water surface elevation of a flood event to location along a stream or river.

Watersheds - A drainage basin or area which collects runoff and transmits it usually by means of streams and tributries to the outlet of the basin.

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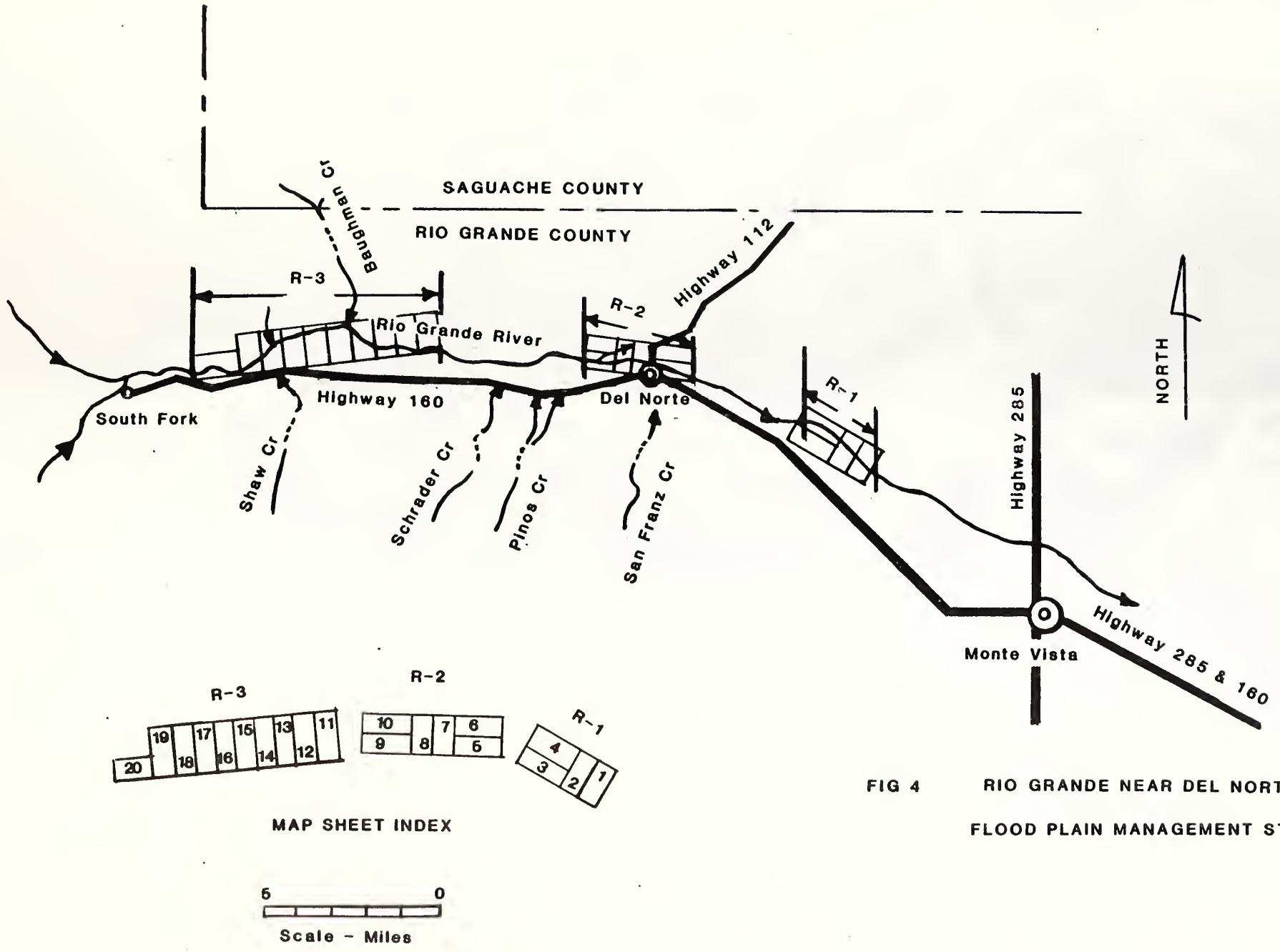

FIG 4 RIO GRANDE NEAR DEL NORTE

FLOOD PLAIN MANAGEMENT STUDY

PREPARED BY

LANDMARK MAPPING
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX

BASIS OF HORIZONTAL CONTROL:
THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED.

	X	Y
GRANGER	370,706.66	1,705,404.87
PLAZA	357,055.90	1,778,401.19

BASIS OF VERTICAL CONTROL:
USC & GS SEA LEVEL DATUM TIED TO THE
FOLLOWING BENCHMARKS

N-163 Y-163
R-163 BM-7674
W-163

TOPOGRAPHY ON THIS MAP COMPLIES WITH
NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS
FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY
FLOWN MAY 5, 1986

LEGEND

500 YEAR
100 YEAR FLOOD
500 YEAR
8068 100YEAR FLOOD ELEV.
STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
INDEX CONTOURS
4'CONTOURS
2' INTERPOLATED CONTOURS
APPOX SECTION LINES
CROSS SECTIONS
HORIZ. CONTROL
PHOTO CENTER
GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 1 OF 20

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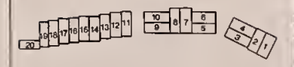
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX



BASIS OF HORIZONTAL CONTROL:

THE COLORADO STATE PLANE COORDINATE SYSTEM SOUTH ZONE LAMBERT CONFORMAL PROJECTION THE FOLLOWING USC & GS TRIANGULATION STATIONS WERE USED :

	X	Y
GRANGER	370,705.65	1,705,404.67
PLAZA	357,055 .90	1,778,401.19

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-163	Y-163
R-163	BM-7674
W-163	

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1966

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV.
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ. CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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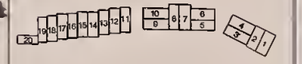
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX



BASIS OF HORIZONTAL CONTROL:
THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED .

	X	Y
GRANDER	370,706.86	1,705,404.87
PLAZA	367,055 .90	1,776,401.19

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-163	Y-163
R-163	BM-7674
W-163	

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1986

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ. CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
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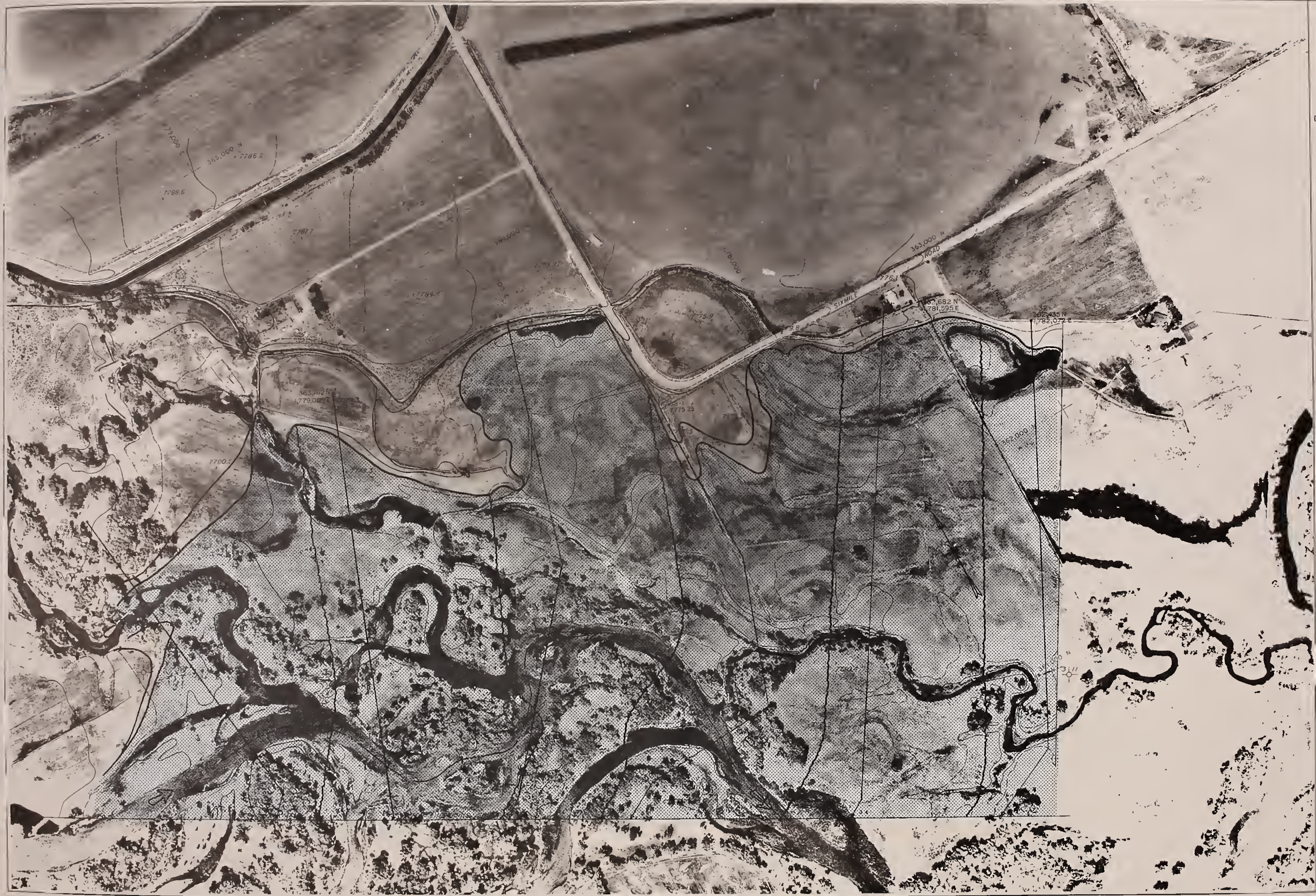
FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 3 OF 20



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BASIS OF HORIZONTAL CONTROL:
THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED :

	X	Y
ORANGER	370,705.65	1,705,404.87
PLAZA	357,055 .90	1,776,401.19

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-163 Y-163
R-163 BM-7674
W-163

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 8"C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1986

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV.
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
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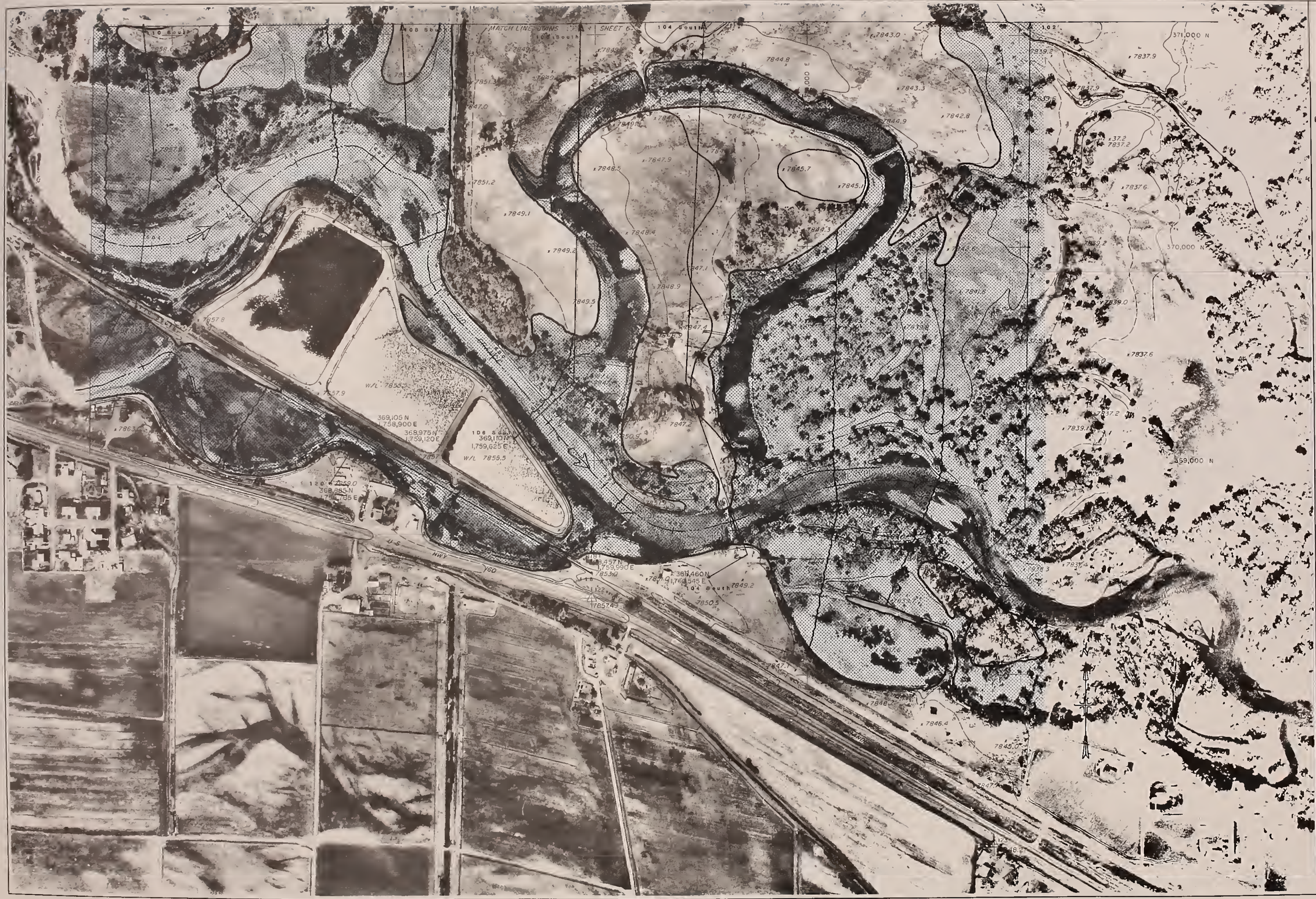
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 4 OF 20



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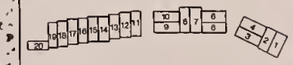
RIO GRANDE SHEET INDEX



BASIS OF HORIZONTAL CONTROL:
THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED :

	X	Y
ORANGER	370,706.66	1,706,404.87
PLAZA	367,066 .00	1,778,401.19

BASIS OF VERTICAL CONTROL:
USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-163 Y-163
R-163 BM-7674
W-163

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 6, 1966

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ. CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
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LAKEWOOD, COLORADO

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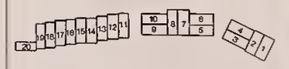

BASIS OF HORIZONTAL CONTROL:
THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED

	X	Y
ORANGER	370,706.65	1,705,404.57
PLAZA	367,055 .90	1,778,401.18

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-163	Y-163
R-163	BM-7674
W-163	

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1988

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ. CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S. DEPARTMENT OF AGRICULTURE
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FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 6 OF 20

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LANDMARK MAPPING
LAKEWOOD, COLORADO

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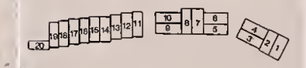

BASIS OF HORIZONTAL CONTROL:
THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED :

	X	Y
GRANGER	370,705.85	1,705,404.67
PLAZA	367,055 .90	1,778,401.19

BASIS OF VERTICAL CONTROL:
USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-183 Y-183
R-183 BM-7874
W-183

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6°C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1986

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ. CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
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FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 7 OF 20

MATCH LINE JOINS SHEET

DEL NORTE

MATCH LINE JOINS SHEET 10

MATCH LINE JOINS SHEET 9

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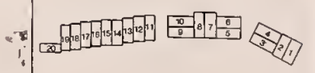
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX



BASIS OF HORIZONTAL CONTROL:

THE COLORADO STATE PLANE COORDINATE SYSTEM SOUTH ZONE LAMBERT CONFORMAL PROJECTION THE FOLLOWING USC & GS TRIANGULATION STATIONS WERE USED :

	X	Y
ORANGER	370,705.65	1,705,404.87
PLAZA	357,055 .90	1,776,401.19

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-163	Y-163
R-163	BM-7674
W-163	

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1986

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV.
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ. CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 8 OF 20

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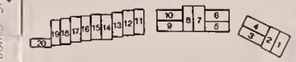
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX



BASIS OF HORIZONTAL CONTROL:
THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED :

	X	Y
GRANGER	370,705.85	1,708,404.67
PLAZA	357,056 .90	1,778,401.19

BASIS OF VERTICAL CONTROL:
USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-183 Y-183
R-183 BM-7674
W-183

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 8°C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1988

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 9 OF 20

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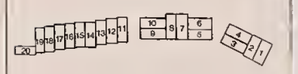
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX



BASIS OF HORIZONTAL CONTROL:

THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED :

	X	Y
GRANGER	370,705.65	1,705,404.67
PLAZA	367,065 .80	1,778,401.19

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-163 Y-163
R-163 BM-7874
W-163

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1986

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV.
- STREAM STATION IN 1000 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ. CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 10 OF 20

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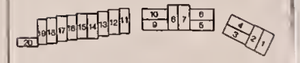
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX



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SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED :

	X	Y
GRANGER	370,705.85	1,705,404.87
PLAZA	357,055 .90	1,778,401.19

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-163 Y-163
R-163 BM-7674
W-163

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1986

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 8068 100YEAR FLOOD ELEV
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ. CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 11 OF 20

MATCH LINE JOINS SHEET 11

376,000 N

375,000 N

374,000 N

1,719,000 E

1,718,000 E

1,717,000 E

1,716,000 E

244
374,341N
1,719,740E

248
375,001N
1,717,4[illegible]

248
374,092 N
1,717,398 E

250
375,[illegible]N
[illegible]92 E

372,290N
716,699 E

371,787 N
1,719,162 E

368 N
7410 E

x7998.4

x7998.2

x7998.3

x7997.9

7998.5
High

x8000.3

x8007.2

x8004.2

x8008.7

x8011.2

x8007.2

x8004.6

x8005.9

x8006.7

x8012.2

x8015.5

x8003.9

x8011.2

8020

8021.3

8021.7

2-7

8000

H

High

GRAVEL

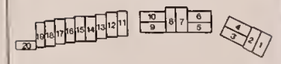
141

N

PREPARED BY

LANDMARK MAPPING
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX



BASIS OF HORIZONTAL CONTROL:
THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED :

	X	Y
ORANGER	370,705.65	1,706,404.87
PLAZA	367,085 .92	1,778,401.19

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-183 Y-183
R-183 BM-7874
W-183

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 8°C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1986

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2'INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ. CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
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FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

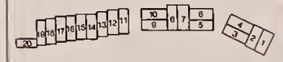
SHEET 12 OF 20

TENNER AND RIO GRANDE WESTERN

PREPARED BY

LANDMARK MAPPING
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX



BASIS OF HORIZONTAL CONTROL:

THE COLORADO STATE PLANE COORDINATE SYSTEM SOUTH ZONE LAMBERT CONFORMAL PROJECTION THE FOLLOWING USC & GS TRIANGULATION STATIONS WERE USED

	X	Y
ORANGER	370,705.65	1,705,404.87
PLAZA	357,065 .90	1,776,401.19

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-163 Y-163
R-163 BM-7874
W-163

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1988

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX SECTION LINES
- CROSS SECTIONS
- HORIZ. CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

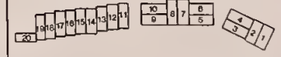
FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 13 OF 20

PREPARED BY

LANDMARK MAPPING
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX



BASIS OF HORIZONTAL CONTROL:

THE COLORADO STATE PLANE COORDINATE SYSTEM SOUTH ZONE LAMBERT CONFORMAL PROJECTION THE FOLLOWIND USC & GS TRIANGULATION STATIONS WERE USED :

	X	Y
ORANDER	370,705.65	1,705,404.87
PLAZA	367,085 .90	1,776,401.19

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWIND BENCHMARKS

N-163 Y-163
R-163 BM-7874
W-163

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1986

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV.
- STREAM STATION IN 1DD FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ. CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
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FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 14 OF 20

PREPARED BY

LANDMARK MAPPING
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX

20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

BASIS OF HORIZONTAL CONTROL:
THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED

	X	Y
GRANGER	370,706.66	1,705,404.87
PLAZA	367,066 .90	1,778,401.19

BASIS OF VERTICAL CONTROL:
USC & GS SEA LEVEL DATUM TIED TO THE
FOLLOWING BENCHMARKS

N-163 Y-163
R-163 BM-7674
W-163

TOPOGRAPHY ON THIS MAP COMPLIES WITH
NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS
FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY
FLOWN MAY 5, 1986

LEGEND

500 YEAR
100 YEAR FLOOD
500 YEAR
8068 100YEAR FLOOD ELEV
STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
INDEX CONTOURS
4'CONTOURS
2' INTERPOLATED CONTOURS
APPOX SECTION LINES
CROSS SECTIONS
HORIZ. CONTROL
PHOTO CENTER
GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 15 OF 20

MATCH LINE JOINS SHEET 15

JOINS SHEET 17

274
377,408 N
1,703,642 E

276
377,061 N
1,702,312 E

278
377,846 N
1,701,209 E

274
373,675 N
1,703,615 E

373,572 N
1,702,560 E

373,076 N
1,700,846 E

372,957 N
1,700,225 E

1,703,000 E

1,702,000 E

1,701,000 E

RIO GRANDE WESTERN

DENVER AND

RIO GRANDE

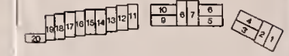
NORTH RIVER DITCH

ROAD

PREPARED BY

LANOMARK MAPPING
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX



BASIS OF HORIZONTAL CONTROL:
THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED :

	X	Y
GRANGER	370,706.65	1,706,404.87
PLAZA	367,055 .90	1,776,401.19

BASIS OF VERTICAL CONTROL:
USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-163 Y-163
R-163 BM-7874
W-163

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1966

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ. CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S. DEPARTMENT OF AGRICULTURE
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FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
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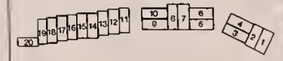
COLORADO

SHEET 16 OF 20

PREPARED BY

LANDMARK MAPPING
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX



BASIS OF NORIZONTAL CONTROL:
THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED :

	X	Y
ORANGER	370,706.66	1,705,404.87
PLAZA	367,066 .90	1,776,401.19

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-163 Y-163
R-163 BM-7874
W-163

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1986

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ. CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S. DEPARTMENT OF AGRICULTURE
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FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 17 OF 20

PREPARED BY

LANDMARK MAPPING
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX

BASIS OF HORIZONTAL CONTROL:
THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED :

	X	Y
GRANGER	370,705.65	1,705,404.67
PLAZA	357,055 .90	1,776,401.19

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE
FOLLOWING BENCHMARKS

N-163	Y-163
R-163	BM-7674
W-163	

TOPOGRAPHY ON THIS MAP COMPLIES WITH
NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS
FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY
FLOWN MAY 5, 1986

LEGEND

500 YEAR
100 YEAR FLOOD
500 YEAR
8068 100YEAR FLOOD ELEV
STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
INDEX CONTOURS
4'CONTOURS
2' INTERPOLATED CONTOURS
APPOX. SECTION LINES
CROSS SECTIONS
HORIZ. CONTROL
PHOTO CENTER
GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
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FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
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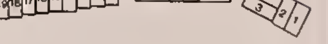
COLORADO

SHEET 18 OF 20

PREPARED BY

LANDMARK MAPPING
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX



BASIS OF HORIZONTAL CONTROL:
THE COLORADO STATE PLANE COORDINATE SYSTEM
SOUTH ZONE LAMBERT CONFORMAL PROJECTION
THE FOLLOWING USC & GS TRIANGULATION
STATIONS WERE USED :

	X	Y
GRANDER	370,708.65	1,705,404.87
PLAZA	357,058 .90	1,778,401.19

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE
FOLLOWING BENCHMARKS

N-183 Y-183
R-183 BM-7574
W-183

TOPOGRAPHY ON THIS MAP COMPLIES WITH
NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS
FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY
FLOWN MAY 8, 1985

LEGEND

500 YEAR
100 YEAR FLOOD
500 YEAR
8068 100YEAR FLOOD ELEV
STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
INDEX CONTOURS
4'CONTOURS
2' INTERPOLATED CONTOURS
APPOX. SECTION LINES
CROSS SECTIONS
HORIZ. CONTROL
PHOTO CENTER
GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

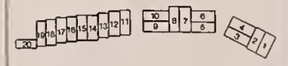
FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 19 OF 20

PREPARED BY

LANDMARK MAPPING
LAKEWOOD, COLORADO

RIO GRANDE SHEET INDEX



BASIS OF HORIZONTAL CONTROL:

THE COLORADO STATE PLANE COORDINATE SYSTEM SOUTH ZONE LAMBERT CONFORMAL PROJECTION THE FOLLOWING USC & GS TRIANGULATION STATIONS WERE USED

	X	Y
ORANGER	370,706.65	1,705,404.87
PLAZA	357,055 90	1,776,401.19

BASIS OF VERTICAL CONTROL:

USC & GS SEA LEVEL DATUM TIED TO THE FOLLOWING BENCHMARKS

N-163 Y-163
R-163 BM-7874
W-163

TOPOGRAPHY ON THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.

COMPILATION BY PHOTOGRAMMETRIC METHODS FROM 6"C.F.L. VERTICAL AERIAL PHOTOGRAPHY FLOWN MAY 5, 1988

LEGEND

- 500 YEAR
- 100 YEAR FLOOD
- 500 YEAR
- 8068 100YEAR FLOOD ELEV
- STREAM STATION IN 100 FT. FROM LOWER STUDY LIMIT
- INDEX CONTOURS
- 4'CONTOURS
- 2' INTERPOLATED CONTOURS
- APPOX. SECTION LINES
- CROSS SECTIONS
- HORIZ CONTROL
- PHOTO CENTER
- GRID POINT

200 0 200 400
scale feet

CONTOUR 4 FEET
INTERPOLATED 2 FEET

U.S.DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PLAINS
FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE NEAR DEL NORTE
IN RIO GRANDE COUNTY
COLORADO

SHEET 20 OF 20

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

LOWER STUDY LIMIT

16 FIVE MILE ROAD

ELEVATION IN FEET (M.S.L.)

7765

7760

7755

7750

7745

7740

0+00

8+00

16+00

24+00

32+00

40+00

48+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 1 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

7775

7770

7765

7760

7755

7750

22

24

28

44+00

52+00

60+00

68+00

76+00

84+00

91+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 2 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

7785

7780

7775

7770

7765

7760

28

30

32

34

36

85+00

93+00

101+00

109+00

117+00

125+00

133+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 3 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

7795

7790

7785

7780

7775

7770

36

38

40

42

UPPER LIMIT REACH #1

133+00

141+00

149+00

157+00

165+00

173+00

181+00

FEET UPSTREAM OF LOWER STUDY LIMIT

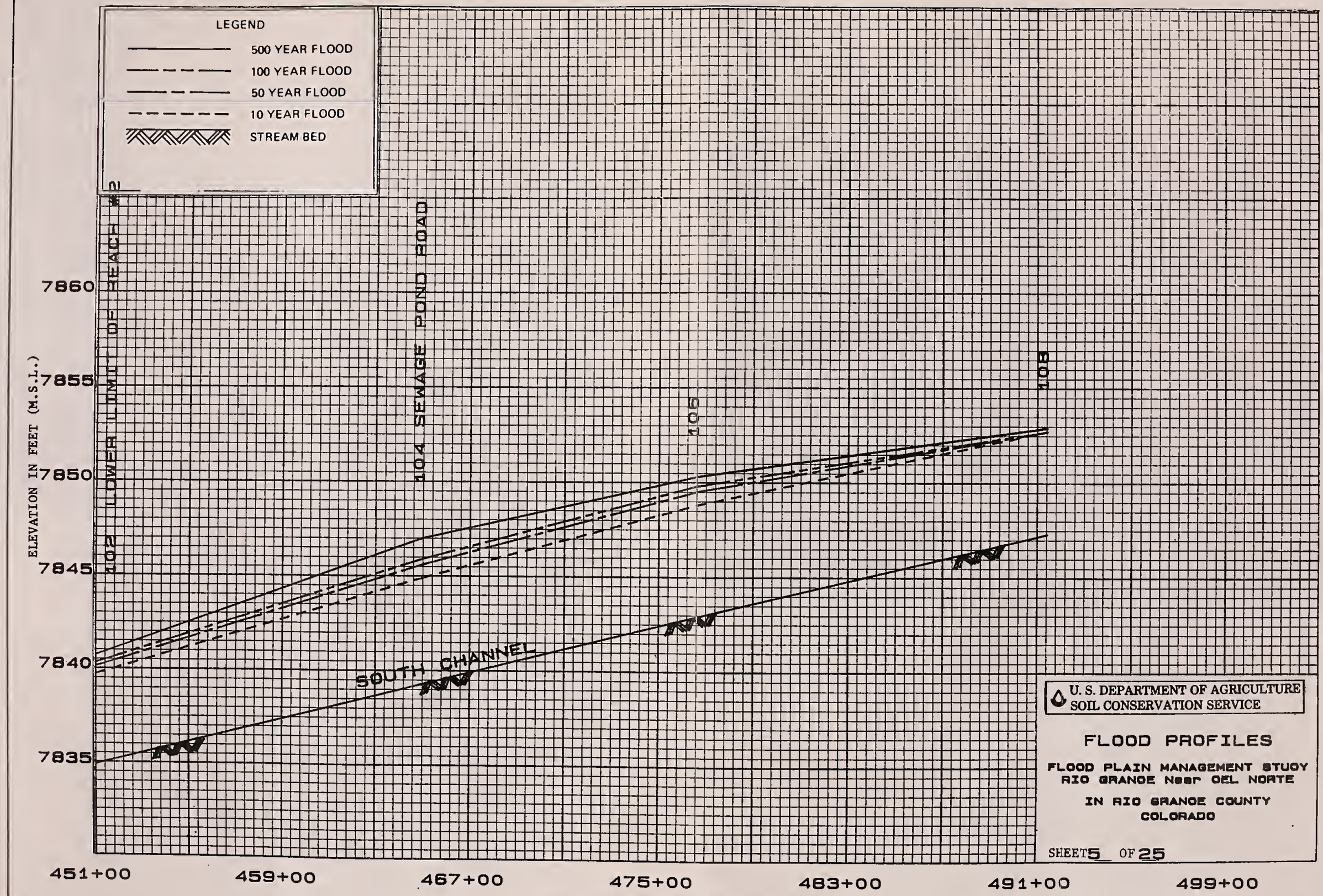
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 4 OF 25



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near OEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 5 OF 25

LEGEND

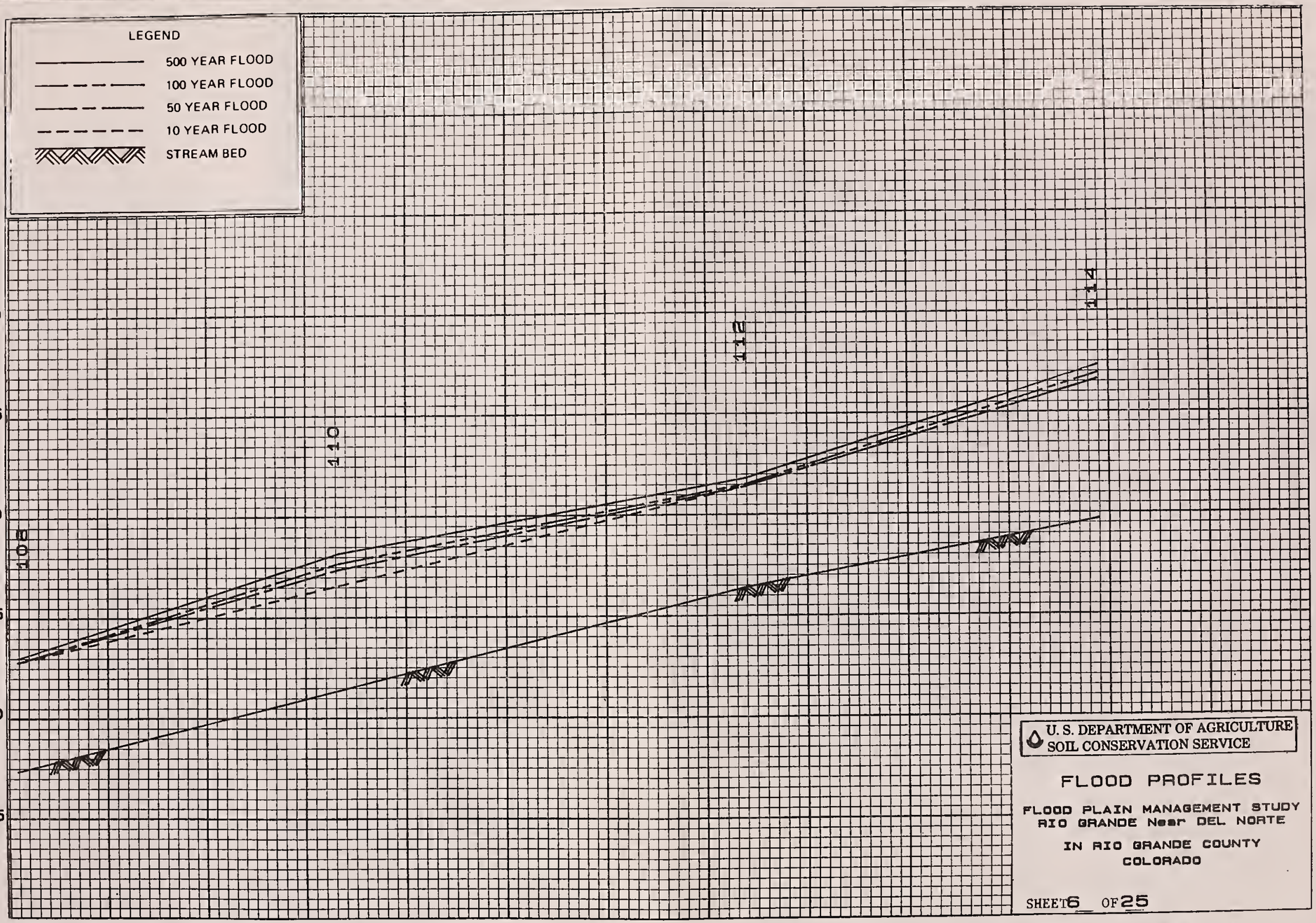
500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 6 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

7885

7880

7875

7870

7865

7860

CO. HIGHWAY 112

114

116

130

132

134

136

534+00

542+00

550+00

558+00

566+00

574+00

582+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 7 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

RIO GRANDE CANAL DIVERSION

ELEVATION IN FEET (M.S.L.)

7895
7890
7885
7880
7875
7870

136
138
140
142
144
146
148

578+00
586+00
594+00
602+00
610+00
618+00
626+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 8 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

7910

7905

7900

7895

7890

7885

146

148

150 UPPER LIMIT REACH #2

625+00

633+00

641+00

649+00

657+00

665+00

673+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 9 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

7860

7855

7850

7845

7840

7835

102

104

106

108

NORTH CHANNEL

451+00

459+00

467+00

475+00

483+00

491+00

499+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 10 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 11 OF 25

ELEVATION IN FEET (M.S.L.)

7870
7865
7860
7855
7850
7845

491+00
499+00
507+00
515+00
523+00
531+00
539+00

FEET UPSTREAM OF LOWER STUDY LIMIT

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

7865

7860

7855

7850

7845

7840

RAILROAD

418

420

422

424

465+00

473+00

481+00

489+00

497+00

505+00

513+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 12 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

7885

7880

7875

7870

7865

7860

124

126

128

516+00

524+00

532+00

540+00

548+00

556+00

564+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 13 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

8000

7995

7990

7985

7980

7975

298 LOWER LIMIT OF REACH 3

239 STATE BRIDGE

240

242

244

920+00

928+00

936+00

944+00

952+00

960+00

968+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 14 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

244

246

248

250

ELEVATION IN FEET (M.S.L.)

8010

8005

8000

7995

7990

7985

970+00

978+00

986+00

994+00

1002+00

1010+00

1018+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 15 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

8025

8020

8015

8010

8005

8000

250

252

254

256

1012+00

1020+00

1028+00

1036+00

1044+00

1052+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 16 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

8035

8030

8025

8020

8015

8010

256

258

260

262

1050+00

1058+00

1066+00

1074+00

1082+00

1090+00

1098+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 17 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

GRANGER BRIDGE

ELEVATION IN FEET (M.S.L.)

8055

8050

8045

8040

8035

8030

262

264

266

268

270

1100+00

1108+00

1116+00

1124+00

1132+00

1140+00

1148+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 18 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

8065

8060

8055

8050

8045

8040

270

272

274

276

1140+00

1148+00

1156+00

1164+00

1172+00

1180+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 19 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

8075

8070

8065

8060

8055

8050

278

280

282

1178+00

1186+00

1194+00

1202+00

1210+00

1218+00

1226+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 20 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

8090

8085

8080

8075

8070

8065

292

294

296

298

1218+00

1226+00

1234+00

1242+00

1250+00

1258+00

1266+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 21 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

8105

8100

8095

8090

8085

8080

288

290

292

294

1258+00

1266+00

1274+00

1282+00

1290+00

1298+00

1306+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 22 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

8115

8110

8105

8100

8095

8090

1300+00

1308+00

1316+00

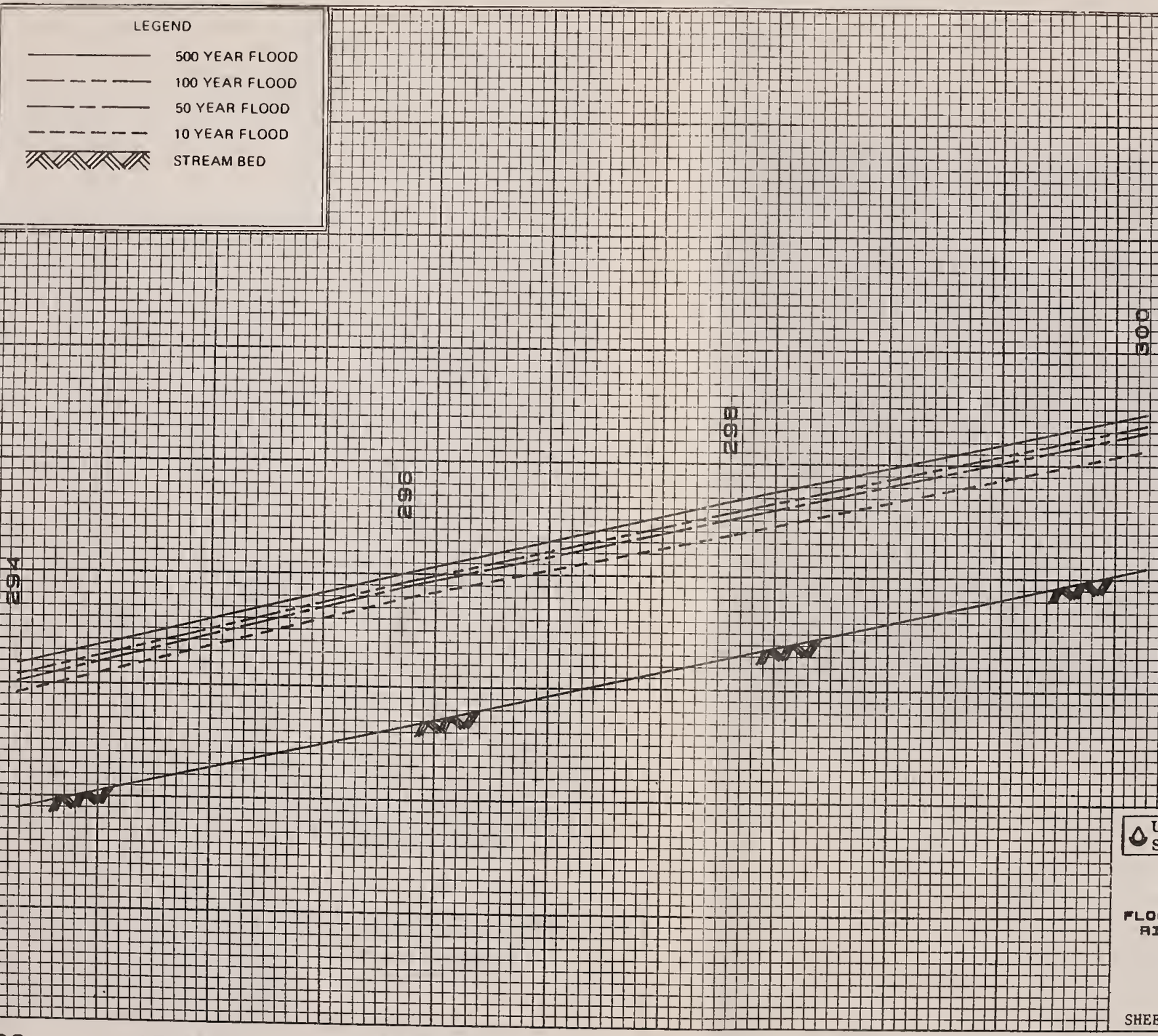
1324+00

1332+00

1340+00

1348+00

FEET UPSTREAM OF LOWER STUDY LIMIT



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 23 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

ELEVATION IN FEET (M.S.L.)

8125

8120

8115

8110

8105

8100

302

304

306

308

1340+00

1348+00

1356+00

1364+00

1372+00

1380+00

1388+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 24 OF 25

LEGEND

500 YEAR FLOOD

100 YEAR FLOOD

50 YEAR FLOOD

10 YEAR FLOOD

STREAM BED

GERARD BRIDGE

UPPER STUDY LIMIT

310

312

314

316

ELEVATION IN FEET (M.S.L.)

8140

8135

8130

8125

8120

8115

1388+00

1396+00

1404+00

1412+00

1420+00

1428+00

FEET UPSTREAM OF LOWER STUDY LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FLOOD PROFILES

FLOOD PLAIN MANAGEMENT STUDY
RIO GRANDE Near DEL NORTE

IN RIO GRANDE COUNTY
COLORADO

SHEET 25 OF 25

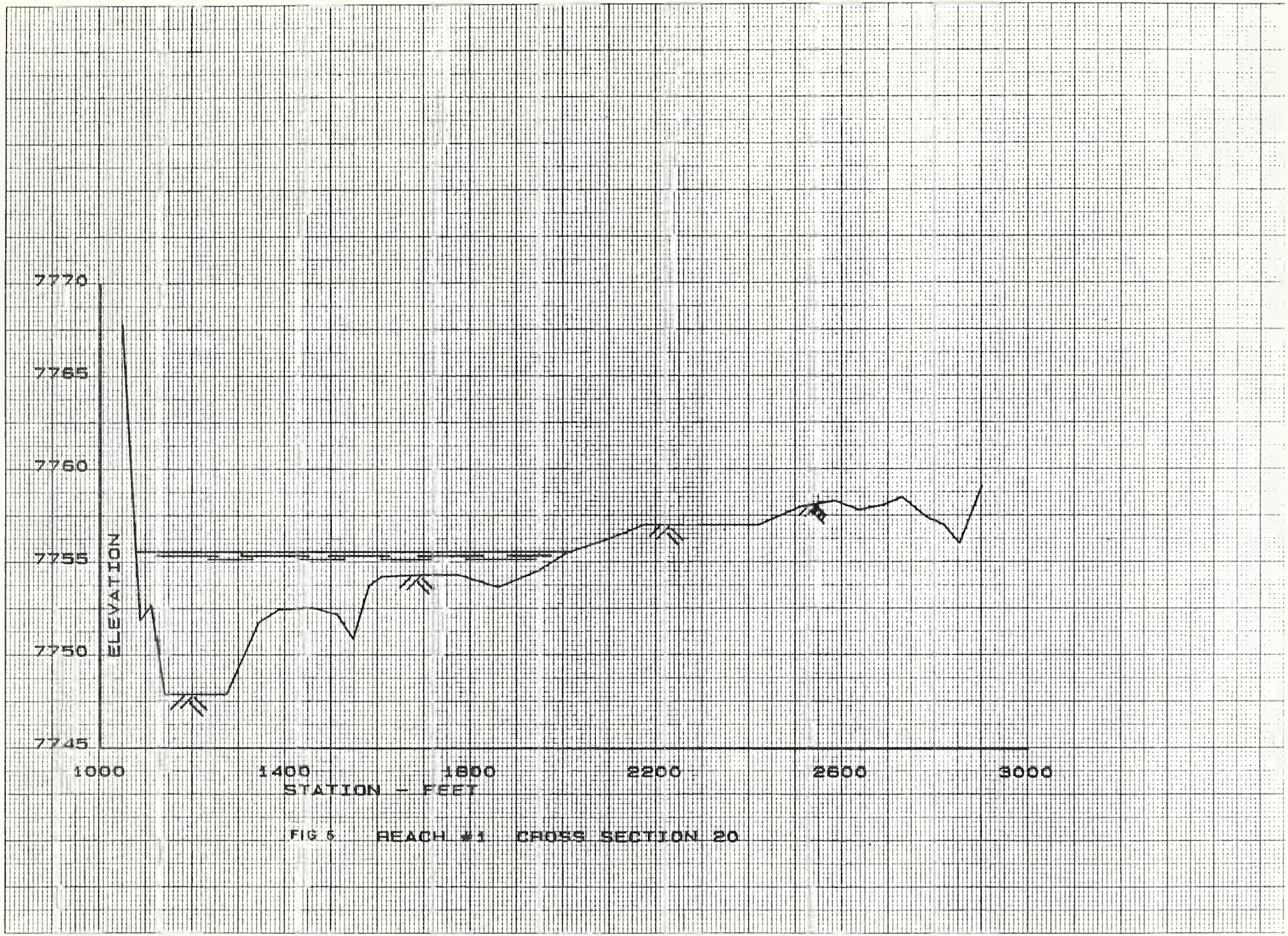


FIG 5 REACH #1 CROSS SECTION 20

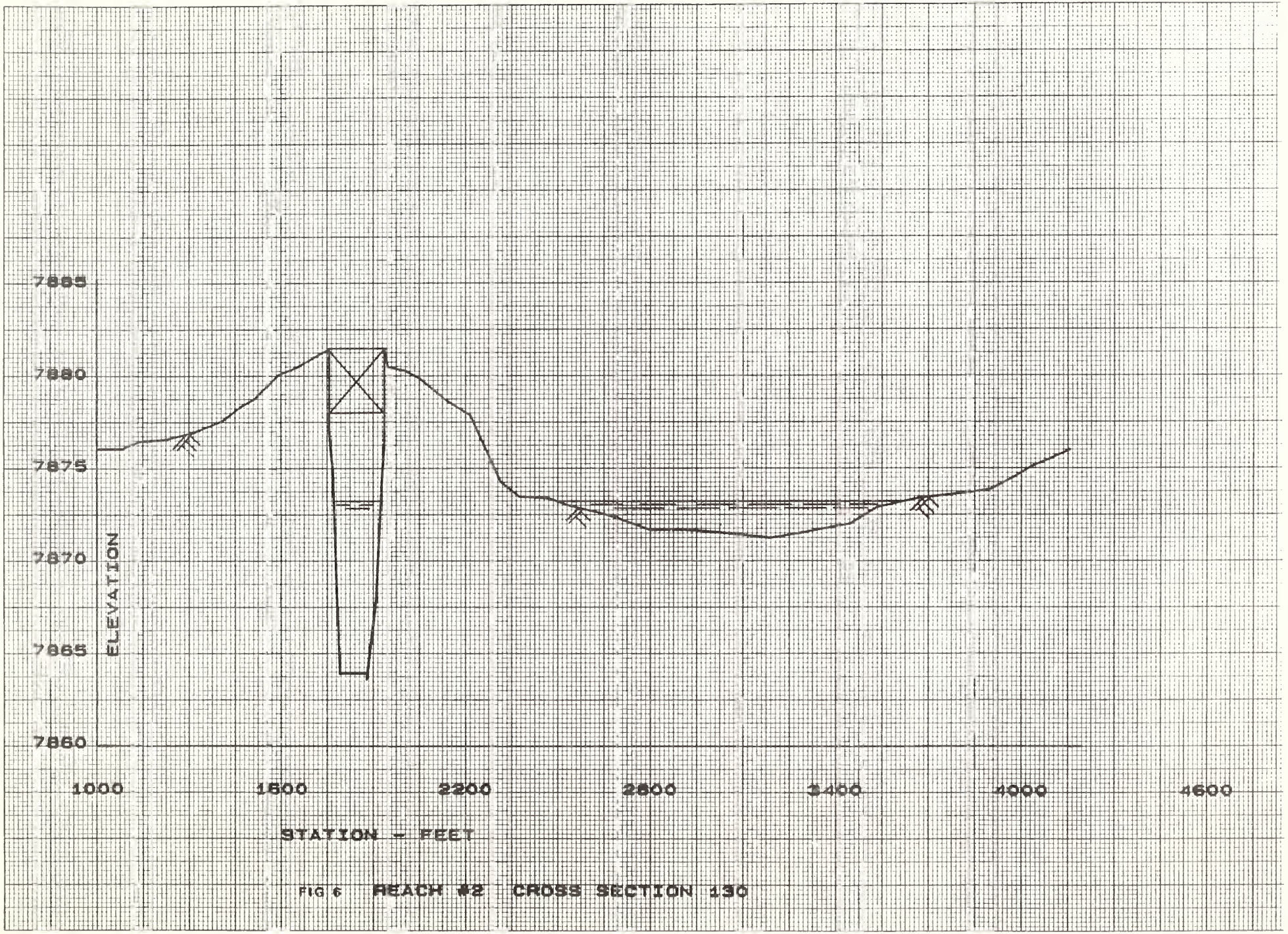


FIG 6 REACH #2 CROSS SECTION 130

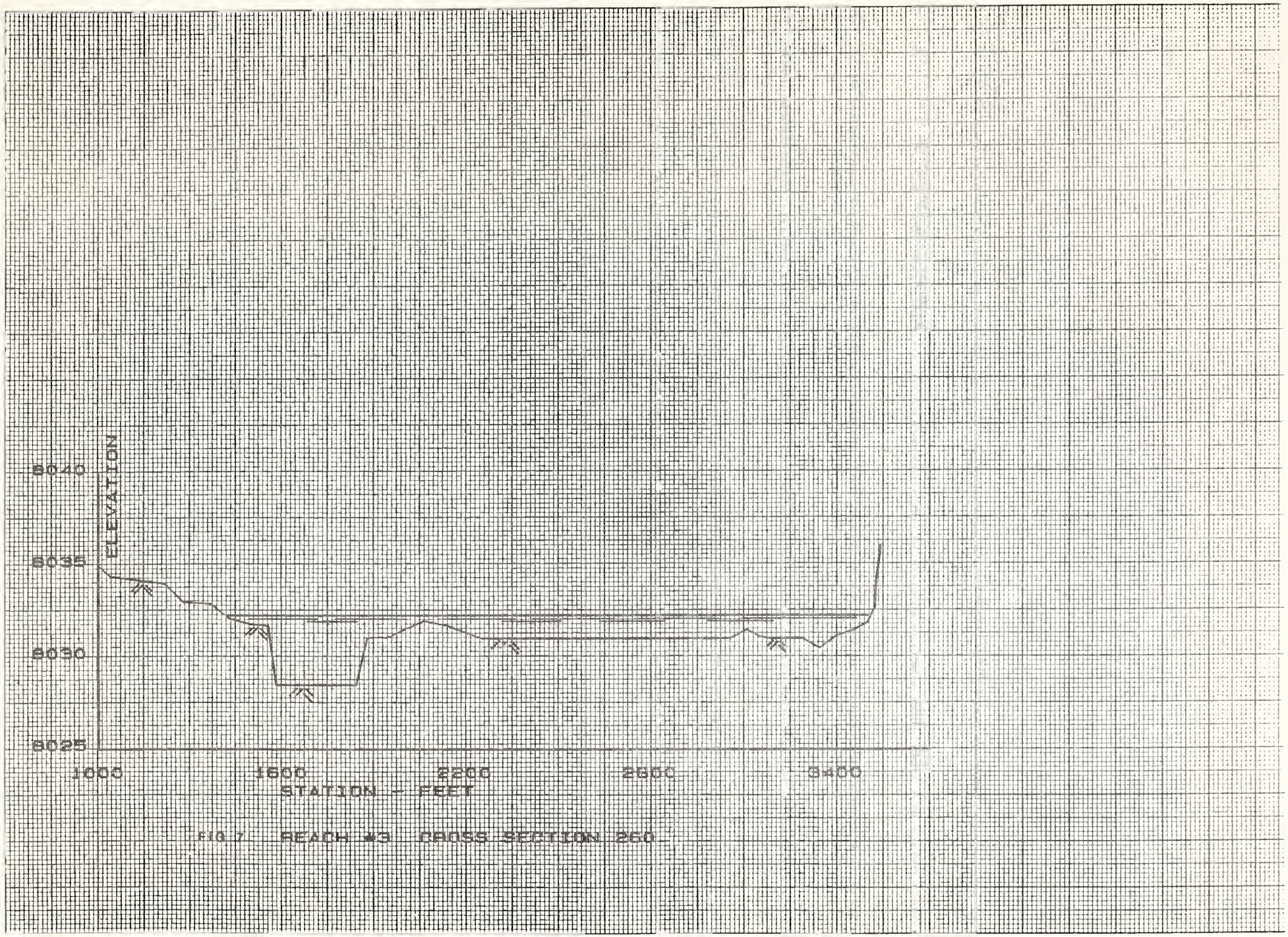


FIG 7 REACH #3 CROSS SECTION 260

TABLE 1 FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA *

Cross Section Designation	Stationing From Lower Limit Feet	Location of Cross Section	Stream Bed Elevation Feet	Crest-Elevation and Peak Discharge c.f.s. 10-Year Flood	50-year Flood	100-Year Flood	500-Year Flood
10	0+00	Lower Study Limit Reach #1	7740.0	7746.2	7747.0	7747.3	7748.1
				7000	10600	12800	18550
12	9+20		7742.0	7748.2	7749.1	7749.4	7750.2
				7000	10800	12800	18550
14	19+00		7744.3	7750.3	7751.4	7751.9	7753.1
				7000	10800	12800	18550
16.1	21+35	Five Mile Road	7744.7	7750.8	7752.0	7752.4	7753.1
				7000	10800	12800	18550
16.3	22+20	Five Mile Road	7744.7	7751.2	7752.5	7753.1	7754.5
				7000	10800	12800	18550
18	24+80		7745.7	7752.3	7754.0	7754.8	7757.0
				7000	10800	12800	18550
20	33+80		7747.9	7754.1	7755.1	7755.6	7757.4
				7000	10800	12800	18550
22	44+10		7750.3	7756.7	7756.0	7758.6	7759.8
				7000	10800	12800	18550
24	57+00		7753.4	7760.5	7761.6	7761.9	7762.7
				7125	10850	12775	18300
26	65+20		7755.4	7762.1	7763.1	7763.6	7764.5
				7125	10850	12775	18300
28	85+60		7760.4	7765.8	7766.6	7766.9	7767.7
				7125	10850	12775	18300
30	96+60		7763.4	7767.6	7768.2	7768.5	7769.2
				7125	10850	12775	18300
32	111+60		7766.4	7770.7	7771.0	7771.2	7771.6
				7250	10900	12750	18050

* Flood elevations pertain to the primary channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the primary channel due to road crossings, upstream diversions, etc.

TABLE 1 FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA *

Cross Section Designation	Stationing From Lower Limit Feet	Identification	Stream Bed Elevation Feet	Crest-Elevation and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
34	125+40		7768.0	7772.8 7250	7773.3 10900	7773.5 12750	7774.0 18050
36	133+00		7770.1	7774.2 7250	7774.7 10900	7774.9 12750	7775.4 18050
38	143+40		7772.2	7776.7 7250	7777.3 10900	7777.5 12750	7778 18050
40	156+00		7774.2	7778.4 7250	7778.9 10900	7779.1 12750	7779.7 18050
42	163+20	Upper End - Reach #1	7775.6	7780.3 7250	7781.2 10900	7781.2 12750	7781.8 18050

* Flood elevations pertain to the primary channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the primary channel due to road crossings, upstream diversions, etc.

TABLE 1 FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA *

Cross Section Designation	Stationing From Lower Limit Feet	Identification	Stream Bed Elevation Feet	Crest-Elevation and Peak Discharge c.f.s. 10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
102	451+00	Lower End - Reach #2	7835.0	7839.8	7840.2	7840.4	7840.8
				7700	11100	12750	17200
104 South	465+00	South Channel	7839.4	7845.0	7845.7	7846.0	7847.1
				6200	9350	10750	14950
106 South	476+60	South Channel	7843.0	7848.9	7849.7	7849.9	7850.4
				5900	7850	8550	10550
108 South	491+40	South Channel	7847.4	7852.7	7852.8	7852.9	7853.0
				5700	7850	8550	10550
110 South	524+40	South Channel	7851.4	7856.6	7857.4	7857.7	7858.2
				5900	7850	8550	10550
112	520+60		7856.4	7861.4	7861.8	7861.9	7862.2
				7400	9600	10550	12600
114	534+60		7859.7	7866.6	7867.1	7867.4	7867.8
				7400	9600	10550	12800
116	546+00		7862.6	7870.2	7870.7	7871.1	7871.6
				7400	9600	10550	12800
130	553+95	Co. Highway 112	7864.0	7872.3	7873.0	7873.3	7873.9
				7700	11100	12750	17200
132	556+40		7864.8	7873.2	7874.1	7874.4	7875.2
				7700	11100	12750	17200
134	567+80		7866.2	7874.3	7875.1	7875.4	7876.1
				7700	11100	12750	17200
136	578+80		7870.8	7877	7877.2	7877.9	7878.9
				7700	11100	12750	17200
138	589+00		7873.2	7880.2	7881.6	7881.9	7882.4
				7700	11100	12750	17200

* Flood elevations pertain to the primary channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the primary channel due to road crossings, upstream diversions, etc.

TABLE 1 FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA *

Cross Section Designation	Stationing From Lower Limit Feet	Identification	Stream Bed Elevation Feet	Crest-Elevation and Peak Discharge c.f.s 10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
140	600+50		7876.0	7883.1	7884.1	7884.5	7885.4
				7700	11100	12750	17200
142	606+70		7877.6	7884.4	7885.6	7886.0	7887.0
				8000	11200	12700	16550
144	610+30		7883.0	7887.3	7888.3	7888.6	7889.1
				8000	11200	12700	16550
146	625+90		7886.5	7892.6	7893.2	7893.5	7894.0
				8000	11200	12700	16550
148	646+70		7892.2	7896.9	7897.5	7897.7	7898.2
				8000	11200	12700	16550
150	666+50	Upper End - Reach #2	7897.6	7903.6	7903.9	7904.0	7904.2
				8000	11200	12700	16550
104 South	465+00	Divided flow Segment Reach #2	7839.4	7845.0	7845.7	7846.0	7847.1
				6200	9350	10750	14950
118.1	473+75	Railroad	7842.0	7849.2	7849.7	7852.5	7852.9
				300	1500	2200	4400
118.3	474+25	Railroad	7842.0	7851.7	7852.7	7852.8	7853.3
				300	1500	2200	4400
120	487C		7849.0	7852.4	7854.5	7855.2	7856.4
				300	1500	2200	4400
122	503+50		7854.5	7855.0	7856.9	7857.5	7858.8
				300	1500	2200	4400
124	516+40		7859.7	7860.7	7860.8	7861.0	7861.6
				300	1500	2200	4400

Flood elevations pertain to the primary channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the primary channel due to road crossings, upstream diversions, etc.

TABLE I FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA *

Cross Section Designation	Stationing From Lower Limit Feet	Identification	Stream Bed Elevation Feet	Crest-Elevation and Peak Discharge c.f.s. 10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
126	527+00		7863.4	7864.3	7865.7	7866.0	7866.7
				300	1500	2200	4400
128	543+00	Upper End of Divided Flow Seg - Reach #2	7868.0	7868.6	7869.2	7869.5	7870.2
				300	1500	2200	4400
102	451+00	Divided Flow Segment Reach - #2	7835.0	7839.8	7840.2	7840.4	7840.8
				7700	11100	12750	17200
104 North	466+30	North Channel	7839.4	7844.4	7844.6	7844.8	7845.0
				1500	1750	2000	2250
106 North	477+20	North Channel	7843.1	7847.0	7847.3	7847.6	7847.9
				1500	1750	2000	2250
108 North	492+30	North Channel	7847.4	7852.0	7852.3	7852.5	7852.8
				1500	1750	2000	2250
110 North	506+60	Upper End Divided Flow Seg Reach - #2	7851.4	7855.7	7856.0	7856.3	7856.5
				1750	1750	2000	2250

* Flood elevations pertain to the primary channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the primary channel due to road crossings, upstream diversions, etc.

TABLE 1 FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA *

Cross Section Designation	Stationing From Lower Limit Feet	Identification	Stream Bed Elevation Feet	Crest-Elevation and Peak Discharge c.f.s.			
				10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
236	920+00	Lower End Reach #3	7975.0	7980.1 8400	7980.6 11400	7980.8 12700	7981.0 15800
238.1	932+20	State Bridge Road	7976.6	7984.3 8400	7984.8 11400	7987.3 12700	7987.6 15800
238.3	933+10	State Bridge Road	7976.6	7985.4 8400	7987.6 11400	7987.9 12700	7988.4 15800
240	944+10		7983.2	7989.9 8400	7990.1 11400	7990.2 12700	7990.6 15800
242	958+50		7988.0	7993.4 8400	7994.3 11400	7994.6 12700	7995.1 15800
244	971+30		7991.7	7997.1 8400	7997.6 11400	7997.8 12700	7998.2 15800
246	988+60		7997.3	8003.0 8400	8003.5 11400	8003.6 12700	8003.9 15800
248	999+20		8001.0	8006.0 8400	8006.5 11400	8006.7 12700	8007.1 15800
250	1012+00		8004.5	8009.5 8400	8010.0 11400	8010.2 12700	8010.6 15800
252	1025+00		8008.7	8013.6 8400	8014.1 11400	8014.3 12700	8014.6 15800
254	1039+00		8013.0	8018.6 8400	8019.3 11400	8019.6 12700	8020.1 15800
256	1051+00		8017.0	8023.2 8400	8023.8 11400	8024.3 12700	8024.7 15800
258	1068+00		8022.2	8027.5 8400	8028.0 11400	8028.1 12700	8028.5 15800

* Flood elevations pertain to the primary channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the primary channel due to road crossings, upstream diversions, etc.

TABLE 1 FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA *

Cross Section Designation	Stationing From Lower Limit Feet	Identification	Stream Bed Elevation Feet	Crest-Elevation and Peak Discharge c.f.s. 10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
260	1086+60		8028.5	8031.7	8032.1	8032.2	8032.4
				8000	11200	12650	15800
262	1101+60		8033.5	8037.9	8038.3	8038.5	8038.9
				8000	11200	12650	15800
264	1111+40		8036.0	8041.1	8041.6	8041.8	8042.2
				8000	11200	12650	15800
266	1132+60		8043.0	8048.0	8048.6	8048.8	8049.2
				8000	11200	12650	15800
268.1	1136+05	Granger Bridge Road	8043.0	8048.0	8050.4	8050.6	8051.0
				8000	11200	12650	15800
268.3	1136+85	Granger Bridge Road	8043.0	8049.8	8051.1	8051.4	8051.8
				8000	11200	12650	15800
270	1141+20		8045.5	8051.3	8052.0	8052.3	8052.7
				8000	11200	12650	15800
272	1153+00		8049.5	8054.4	8055.3	8055.5	8055.9
				8000	11200	12650	15800
274	1167+20		8054.0	8059.3	8059.7	8059.9	8060.3
				8000	11200	12650	15800
276	1178+60		8057.7	8062.1	8062.9	8063.1	8063.6
				8000	11200	12650	15800
278	1194+90		8062.7	8067.7	8068.3	8068.6	8069.2
				8000	11200	12650	15800
280	1208+70		8067.0	8071.6	8072.5	8072.8	8073.3
				8000	11200	12650	15800
282	1219+30		8070.5	8075.6	8076.4	8076.5	8076.9
				8000	11200	12650	15800

* Flood elevations pertain to the primary channel and usually remain constant in a lateral direction across the flood plain. However, flood elevations in the outer portions of a cross section may differ from the primary channel due to road crossings, upstream diversions, etc.

TABLE 1 FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA *

Cross Section Designation	Stationing From Lower Limit Feet	Identification	Stream Bed Elevation Feet	Crest-Elevation and Peak Discharge Data 10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
284	1230+50		8074.0	8078.9	8079.5	8079.7	8080.2
				8000	11200	12650	15800
286	1243+30		8078.0	8083.4	8084.1	8085.1	8085.4
				8000	11200	12650	15800
288	1258+90		8082.7	8089.0	8090.0	8090.1	8090.6
				7600	11000	12600	15800
290	1271+10		8086.3	8091.6	8092.2	8092.5	8092.9
				7600	11000	12600	15800
292	1287+10		8090.5	8096.2	8096.9	8097.1	8097.6
				7600	11000	12600	15800
294	1301+10		8094.5	8099.9	8100.4	8100.7	8101.2
				7600	11000	12600	15800
296	1315+10		8098.3	8104.3	8105.0	8105.2	8105.6
				7600	11000	12600	15800
298	1326+60		8101.5	8106.7	8107.4	8107.6	8108.1
				7600	11000	12600	15800
300	1341+10		8105.5	8110.7	8111.6	8111.9	8112.4
				7600	11000	12600	15800
302	1353+80		8109.0	8114.1	8114.7	8114.9	8115.4
				7600	11000	12600	15800
304	1365+60		8112.5	8118.0	8118.8	8119.1	8119.5
				7600	11000	12600	15800
306	1378+80		8116.0	8120.9	8121.7	8121.9	8122.4
				7600	11000	12600	15800
308	1389+60		8118.7	8123.4	8124.4	8124.8	8125.5
				7600	11000	12600	15800

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TABLE 1 FLOOD FREQUENCY-ELEVATION AND DISCHARGE DATA *

Cross Section Designation	Stationing From Lower Limit Feet	Identification	Stream Bed Elevation Feet	Crest-Elevation and Peak Discharge c.f.s. 10-Year Flood	50-Year Flood	100-Year Flood	500-Year Flood
310	1401+10		8122.2	8128.4	8129.5	8129.9	8130.6
				7600	11000	12600	15800
312	1411+70		8125.3	8131.3	8132.4	8132.9	8133.7
				7600	11000	12600	15800
314.1	1418+70	Gerrard Bridge Road	8125.5	8132.7	8133.7	8134.1	8134.6
				7600	11000	12600	15800
314.3	1419+50	Gerrard Bridge Road	8125.5	8133.0	8134.1	8134.6	8135.3
				7600	11000	12600	15800
316	1421+70	Upper Study Limit	8128.0	8133.7	8135.3	8136.0	8137.1
				7600	11000	12600	15800

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